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WHAT CONSTITUTES PUBLICATION?[1]

YOUR secretary has assigned to me a Chinese puzzle.

Kindly permit me, in accepting this assignment, to make one point unambiguous, namely, that in any views expressed to-day I am speaking only in my individual capacity, as a specimen of the genus *Homo* and not as secretary of the International Commission on Zoological Nomenclature. In fact, it is entirely conceivable that at some future time, as mouthpiece of the commission, I might express views at variance with the content of this paper.

A second point to be made clear is that no definition of zoological publication can be formulated which is not subject to debate, differences of opinion and criticism.

With this introduction I feel at liberty to discuss this very complicated theme.

"Publication" has numerous definitions, more or less subjective according to the particular field and goal under consideration. Our problem is "what constitutes zoological publication?"

Whatever subject we discuss, it is both interesting and instructive to consider the derivation of our terms in order to gain a starting point.

The English word "publication" comes from the Latin *publicatio,* which means "an adjudging to the public treasury, confiscation." Thus, when a zoological manuscript (legally the property of an individual) is published, its content becomes, by confiscation, the property of the *populus zoologicus. Ergo,* from the moment of publication the author has no more claim to the data or the ideas contained therein than has any other member of the zoological profession, except in so far as he may take out a copyright (which gives the exclusive right to multiply and to dispose of copies of an intellectual production—corresponding to a patent of an invention).

Consequently, the author has no more right to change a given published name than has any other zoologist—although the code of ethics provides that in case the author has inadvertently published a homonym, the colleague who notices this fact is to invite the attention of the author to it and, as an act of professional courtesy, to give him first opportunity to correct his error in technique.

The word *publicatio* is based on the Latin *publicare,* which means "to make public property, to seize and

[1] Address, by invitation, before American Ornithological Union, Nov. 15, 1927.

adjudge to public use, to confiscate; to show or tell to the public, to impart to the public, to make public; to publish, etc."

Publicare involves *publicus*,[2] a contraction of *populicus*, from *populus*, which from the root *ple*, of *pleo* (*cf. plenum*), means the people, multitude, host, crowd, throng, great number of persons, etc. *Pleo*, root *ple*,[3] brings us to rock foundation, and means "to fill, to fulfill."

The conclusion appears to be justified that the underlying basic idea in the English word "publication" involves the conception of reaching the *complete*, namely, *not abridged* public.

The completeness of a notice depends upon the audience it is intended to reach. A notice by the American Ornithological Union is complete and therefore published if it is intended only for the members of the American Ornithological Union and if it is addressed through regular channels to each and every member, namely, the *populus* of the American Ornithological Union.

Applying this idea to zoological publication, the conclusion appears justified, from the root *ple*, that a zoological document is published when it is addressed, through regular standard channels of communication, and therefore made potentially available, to the entire zoological public, *i.e.*, the zoologists of the world.

If this viewpoint, based on the conception *populus zoologicus*, be accepted, the corollary obtains that no document addressed to a "limited," "restricted," or "abridged" portion of the zoological public, is, theoretically, zoological publication—since it is not addressed to the entire profession. Thus, if a member of the American Ornithological Union communicates a thought, data regarding a new species, etc., to a colleague, or to all the members of the American Ornithological Union, and restricts or abridges its dissemination by any method which prevents it from reaching the entire zoological public, his act is not zoological publication.

On this principle, neither the date of manuscript nor the presentation of a paper before a restricted audience is accepted as zoological publication, but it becomes publication on the date when the document becomes potentially available to the entire zoological public. On this same principle, proof sheets sent to colleagues to obtain their criticisms have been declared (Opinion 87 of the International Commission) as not constituting zoological publication; and the same principle comes into consideration in connection with the much-discussed Huebner's Tentamen, which was by title addressed to experts, in this case specialists in *Lepidoptera* (see Opinion 97).

With this theoretically basic idea contained in the root *ple*, which thus represents the constitution of publication, so to speak, let us pass to the by-laws (or technique) by means of which the constitution is administered. Here we reach various *practical* aspects of the subject.

It is to be frankly accepted that the technique of publication varies according to the audience addressed, as, for instance, in the case of the board of health regulations of Washington, D. C., which do not involve the citizens of China or South Africa.

The practical problem is: What by-laws are necessary, reasonable and feasible in order that zoological publications may be potentially and reasonably available for use by the *populus zoologicus?* In this connection, it is well to consider—(1) Period of publication; (2) date of publication; (3) address of publisher; (4) language used; (5) status as record; (6) size of edition; (7) methods of manifolding manuscript; (8) sale; (9) daily newspapers; (10) separata; (11) sales-catalogues; (12) society programs.

(1) *Period of publication:* The *populus zoologicus* has varied at different times. In 1760, zoologists were located chiefly, but not exclusively, in Europe. To-day, they are widely distributed practically over the entire world.

The practical condition of making publications reasonably available to the zoological public in 1760 could be largely met by the system of distributing university theses, by exchange, to the leading university centers of Europe without placing the documents on sale. Thus, this system of university exchange could well be accepted in 1760 as largely meeting the necessities of the profession and thus it comes within the basic idea of publication.

To-day, however, the exchange system, not backed by public sale, is thoroughly inadequate to meet the reasonable requirements of the profession; hence this system, still in vogue to some extent, can no longer be reasonably accepted as zoological publication.

The moral is that the requirements as respects distribution vary according to the numbers and geographic distribution of the members of the profession; hence chronologically these requirements are a variable

[2] *Publicus* refers to a public officer; *publicum* to the public purse, also a public place; *publice* on account, at the cost, in behalf, or in charge of the state, also, before the people, openly, publicly.

[3] *Plenus*, from the same root (*cf.* Greek πλα; Latin *plerus, plebs, populus*, etc.), means full, filled; *plenum*, a space occupied by matter, full packed, laden, entire, complete, full, whole, at full length, not contracted, unabridged, abundant, plentiful, much, finished, ample. *Plene*, literally full, means fully, wholly, completely, thoroughly, largely, etc. The same root is found in *plerus* (very many), *plerusque* (a very great part), *pleraque* (all, everything, mostly, for the most part), *plerumque* (the greatest part, commonly).

factor, and what might be reasonably accepted as publication in 1760, 1800 or 1850 is not of necessity to be accepted as publication in 1927.

(2) *Date of publication:* As the law of priority is based upon chronological data, it is obvious that the date of publication is an essential factor in the by-laws of zoological publication.

In the vast majority of cases, the year date suffices; in a lesser number of cases, the month is necessary; in exceptional cases, the day of the month is imperative.

The general principle is universally recognized, so far as I recall, that the date borne by a publication is assumed to be correct unless and until proved to be incorrect.

In connection with the date, various complications—some theoretical, others practical—arise.

For instance, the point has been raised that it may still be November 15 in San Francisco at a moment when it is November 16 in London. Thus, two publications, differing in date by one day, might be issued at the same moment in London and in San Francisco. Which has priority? This same point has been raised in connection with the new wording of the law of priority, and the commission has settled it in advance by definitely stating in its report to the congress that the revised law of priority takes effect at Greenwich time midnight between December 31, 1930, and January 1, 1931. Accordingly, for the United States, the new wording actually becomes effective in the latter part of December 31, by our time.

In connection with the date of publication, serious printers' difficulties are often encountered which are beyond the control of either the author or the editor. Theoretically, it would be wise to print the year, month and day of the month on every zoological publication; but practically this is often impossible, for delays due to proofreading, breakdown of machinery, strikes, etc., etc., are always likely to occur and thereby invalidate the intended exact date of issue as set up in type. To prescribe these details is therefore not always practical, notwithstanding their desirability. But, as the saying goes, "there is more than one way to skin a cat": It is entirely feasible for a serial publication to print in its volume table of contents the exact dates of issue of the separate parts[4] or of each number in each succeeding number, or on the cover or last page of its final number, or in the first number of the next volume.

[4] As a side question in this connection, libraries should always bind in place the cover page of each number when they make up the volume. A failure to do this causes much extra labor for persons who use the serial.

But what is to be said of documents which bear no date at all? Theoretically, two possibilities come into consideration:

(a) Establish the date by evidence obtained elsewhere, as in the case of Huebner's (1806) Tentamen; and

(b) Reject the document on the ground that it lacks the evidence necessary for the application of the law of priority.

In principle, I favor the second alternative. In documents undated as to publication the publisher has not "played the game" with the profession; he has made a "foul play" and the "foul" should be ruled out. I should be inclined to support this as a thoroughly justified rule in connection with future publications. But ought it be made retroactive? Here certain practical considerations arise.

Some undated publications contain names which many authors have adopted. Should we not temper justice with mercy, as applied to some exceptional cases?

If one replies that a principle once adopted should be consistently carried out, and therefore be made retroactive, the answer can be made that we are often faced by choosing between two principles, one primary and more important, the other secondary and less important. As a matter of fact, does not everybody subordinate some secondary principle to some primary principle more or less frequently, possibly every day?

It would not hurt my conscience to vote to suspend the rules for Huebner's Tentamen, despite the fact that it was undated, provided entomologists prove that the rejection of this document will result in greater confusion than uniformity, although to my mind the Tentamen is not zoological publication, but essentially entomological correspondence addressed to a restricted audience.

In principle, I consider that undated documents do not correspond with the technique necessary to make them of reasonable use by the *populus zoologicus*, and, therefore, that they are not zoological publication. It seems eminently unfair to throw upon the reader the burden of proof as respects the date of a document; it causes extra and unreasonable work and easily leads to different conclusions, with later confusion in nomenclature.

For documents of indefinite year date (for instance, "Proceedings for the years 1891–95"), with no further clew as to date of issue, it would seem fair to consider December 31, 1895, as date of publication; and for documents issued with no more exact date than the year (example, "1927") it would appear fair to accept December 31 as date unless and until more definite date is proved.

(3) *Address of publisher:* The address of the publisher is scarcely a *sine qua non* of publication, for it is not zoologically essential to know whether or by whom a given document was printed in London, New York or elsewhere. But think of the unnecessary extra work caused our friends-in-need, the bookdealers and the librarians, when the address of the publisher is not stated. Some printed zoological documents have been distributed without any direct intimation as to whether they were printed in North America, England or Australia, and this point has been raised against one document which is supposed to have been printed at home by the author's son who is said not to be a trade printer.

Cases of this kind seem to have their origin in certain economic conditions which will be referred to later.

I would welcome a rule, effective (say) January 1, 1931, that no document be accepted as publication unless it bears the name of the publisher (or printer) with at least the name of the city in which his office is located. Before making such a rule retroactive, however, I would desire information as to its possible effect on nomenclature and further I would want the viewpoints of booksellers, librarians and publishers, with whom we should "play the game" fairly.

(4) *Language of publication:* Prior to 1800, the question of language of publication was relatively uncomplicated. Latin was read and written by most zoologists and thus formed an acceptable language for the *populus zoologicus.* Not unnaturally, however, even prior to 1800, some zoologists published in the modern languages—chiefly in those of western Europe, which also were understood more or less generally by the zoological public.

How much more complicated this problem is to-day! Professional zoologists are more widely distributed now as respects their mother tongue, some countries lay much less stress than formerly upon the ability to write in Latin, and the semi-professional and the amateur zoologists have increased tremendously in number and distribution.

Not only a theoretical question of national pride, but also practical questions of local economic conditions and other considerations now lead zoologists to publish in Hungarian, Japanese, Polish, Russian and other languages not ordinarily understood by the average zoologists, and the resulting international difficulties of potential availability of the contents of zoological literature are rapidly increasing. This represents a much more serious and more practical problem than is usually admitted and its solution is not so self-evident as I wish it were.

Many authors who write in languages not ordinarily studied clearly grasp the situation—as is evidenced by the fact that they append to their articles abstracts in one of the languages more commonly read than their own. Some of the publications in these exceptional languages are abstracted in journals published in the more international tongues.

That the profession will adopt either Latin or any one of the modern tongues as its official language is hardly to be expected and such a course would not solve the practical problem to-day. The most feasible solution appears to be a movement to urge all authors who publish in the exceptional languages to emulate the considerate example of so many of their colleagues by appending summaries in any one of several more or less generally studied languages. Whether it would be feasible to require this, as a premise to their admission under the law of priority, is a question upon which I scarcely feel in a position to make a pronouncement—for this requires an international consensus of opinion.

(5) *Status as records:* Manuscript can be manifolded for various purposes, for instance: Letters of inquiry, letters of instructions, duplicate proof sheets for criticism by colleagues, news letters regarding administrative or personnel items of an organization. These and some other documents are obviously of ephemeral nature and purpose, intended for the information of a restricted audience, and they do not serve the *populus zoologicus* as a permanent record—unless they are reprinted in a journal or definitely placed on sale through regular channels.

The intent of the document to serve as a permanent record of data would seem to be an exceedingly important, possibly a determining factor, in the pertinency of evidence as to zoological publication.

(6) *Size of edition:* We have seen that publication, through the root *ple,* involves the idea of general, unabridged or numerous. At first thought, one might be inclined to apply this concept in mathematical terms to the size of an edition (*i.e.,* the number of printed copies) as a practical standard to define publication. This, of course, would present difficulties, but it suggests certain general deductions.

An ornithological document issued specifically for the use of ornithologists is obviously not issued for the use of the general *populus zoologicus* but for only a fraction of the whole. Although that document may be of greater interest to this minority than it is to the majority, it can conceivably have a direct bearing on the work of the majority. If, however, by virtue of its being issued only to ornithologists it is limited to them, the conclusion seems justified that the edition is too small to be general, therefore it is not a zoological publication—no matter how universally it is distributed to ornithologists. In this hypothetical case, it is

not really the *size* of the edition which comes into consideration, but the restriction of distribution.

Universities more or less generally require that graduates deposit a given number of copies (say twenty-five to forty, in cases personally known to me) of each thesis, and these copies are distributed, on an exchange system, to other universities. Does this represent zoological publication? My opinion is that *as of to-day* it can not be so accepted; this conclusion is based, however, not on the number of copies but on the method of distribution by exchange, a method which to-day does not make documents potentially and reasonably available to the *populus zoologicus*.

A state experiment station might issue a large edition, say five thousand copies, of a zoological bulletin for free and wide distribution *to the farmers of that state*. Here again it is not the size of the edition, but the audience to which it is addressed and distributed which is the more important factor. If that document is not available to the world-wide zoological public through regular channels, it is not theoretically published as a zoological record.

(7) *Method of manifolding manuscript:* The question as to the methods of manifolding manuscript (printing press, photograph, multigraph, stencil, photostat, etc.) is an important one. The printing press is (to a great extent) the standard method. But the multigraph is coming into widespread use in office work and has actually been used for at least one serial publication issued here in Washington by one of the government bureaus. Apparently stencil-made copies of an official serial were once issued by the German imperial government.

This question of method brings up the serious question of economics—and this latter problem carries us into more and more diverging necessities.

In view of the economic problems involved, I am not prepared to take a definite stand on the question of technique of manifolding manuscript as a condition precedent to recognizing publications.

(8) *Sale:* Reasonably to fulfill the requirements of the zoological profession, a document intended as a permanent record should be reasonably accessible to all zoologists.

The fulfillment of this requirement can be met theoretically in either of two ways, namely: (1) the publisher might distribute the document *gratis* to all public, university, college, laboratory and school libraries; or (2) the document might be placed on public sale through recognized trade channels, namely, dealers who are known to make a business of selling zoological publications.

Obviously, the first possibility, though theoretically conceivable, is impracticable for several reasons, *i.e.:* (1) it is economically too expensive; (2) it is inexcusably and economically wasteful; and (3) it is economically excluded from the standpoint of libraries, for public libraries in general have neither the space nor the personnel to take care of all documents. The deduction is, therefore, that free distribution is a most excellent policy—for this makes the document available to zoologists within practical range of the depository, but the conclusion can not be escaped that it does not make it reasonably accessible to the *populus zoologicus*. Accordingly, there is serious objection to making *gift* a determining factor in distribution.

The second possibility (*i.e., sale* through regular channels) makes the document potentially available to the entire zoological profession and therefore fulfills both theoretical and practical requirements.

Accordingly, the conclusion seems justified that as far as zoological documents of record are concerned, the offering for sale through regular zoological bookdealers at time of issue is theoretically a *sine qua non* of zoological publication.

(9) *Is a lay newspaper zoological publication?* Lay newspapers (daily, weekly, city, county, etc.) are on sale, are distributed through regular channels, are dated, their publishers are known, and they more than welcome additional subscribers. Thus they are undoubtedly generally and universally available, despite the fact that zoologists are only an infinitesimal fraction of the audience to which the newspaper is addressed. From this viewpoint, they are undoubtedly zoological publication.

But, are they reasonably available as professional documents of record? To be permanent records, they must be stored in zoological libraries. If the American Ornithological Union adopts the Washington *Post* as its regular medium of addressing the zoological public, each and every zoological society in the world would have the right to adopt the local newspaper of some other city, town or county for the same purpose.

We must pass from the theoretical to the practical. As a practical problem, would any zoological library in the world be in a position, either as respects space, finances or personnel, to keep these newspapers on file for our use? And since very few of them are indexed, could we use them if they were on file? This practical consideration places the daily press in the *reductio ad absurdum,* as respects zoological publication.

(10) *Are "preprints," "reprints," "separata," etc., zoological publication?* This much-discussed question can be approached from more than one angle:

(a) If a "preprint" is to be accepted as publication, then this is actually *the* publication of an article and the journal print is in reality a "reprint." Under this interpretation, how many editors would consent to furnish "preprints"?

(b) Some journals accept manuscript under the condition that the article is not to be published elsewhere. In this case, the author automatically agrees with the editor that neither reprint nor preprint is "publication."

(c) Assume that a manuscript contains "*Tweedledum* new genus" or "*Tweedledum tweedledee* new species": The publication of the new genus or new species represents its literary birth, so to speak. Can a genus or a species be born twice?

(d) Is the "separate" reasonably available to the zoological public through ordinary channels, *i.e.*, is it on sale? If it is, it is neither a "preprint" nor a "reprint" but a distinct publication.

(e) Separates (preprints, reprints, etc.) are essentially complimentary copies for the personal use of the author and his special mailing list, *i.e.*, a restricted distribution. Many of them bear the statement that they are not for sale, and this is *prima facie* evidence that these particular copies are not publication.

(f) To throw upon the reader the burden of proof whether an author uses his "separata" fairly or unfairly to the editor and publisher and has made his separates reasonably available to the zoological public, is not "playing the game" fairly with the reader.

The conclusion (from my viewpoint) is that, in general, evidence which proves that documents are separata (preprints or reprints), is *ipso facto* proof that they are not separate publication, but at best that they take the same date of publication as the journal article. Cases can, however, be imagined in which a so-called "separate" is actual publication and in which the journal article is the reprint. But the interpretation lies near, that republication in a journal is for the purpose of making the article reasonably available to the profession—and if this interpretation be correct, the conclusion seems justified that by republication the author automatically admits that his article was not reasonably available to the profession through his preprints, *ergo* that the preprints were not zoological publication.

It may be frankly admitted that there are viewpoints, *pro* and *con, ad infinitum,* other than those I have presented. For instance, if an author in Washington deposits a copy of a preprint in the Congressional Library, this document is available (after delay for cataloguing and other necessary "red tape") to all zoologists in and near Washington, and it is also available to any zoologist in South Africa who will buy a steamer ticket to an American port and a railroad ticket from there to Washington. But is this reasonable availability from the viewpoint of the zoological public? If this be acknowledged as "playing the game" fairly with the profession—a point I am so narrow-minded as not to support—then it is logical to accept as publication the deposit (in a public library) of a single copy of typewritten or photostatic manuscript, or of duplicate proof (either galley or page) as a preprint, months before the journal appears. This is surely a practical *reductio ad absurdum,* however theoretically correct it may be.

In connection with the general subject of "separata," may I invite attention to the enormous amount of waste to the profession, in time and energy, due to that invention (by some "printer's devil") known as "repaging" of reprints. Just why it is that publishers continue this vicious system which causes so much trouble and expense, I can not understand—but I am not a printer, therefore I do not look through the "book-maker's" spectacles. My view may be narrow and due to gross ignorance, but I labor under the impression that any factor (such as repaging, double-paging, etc.) which decreases the practical value of a document to the user can best be discontinued.

(11) *Are sales catalogues zoological publication?* Think of the amount of printer's ink used in discussing this subject! From my viewpoint (right or wrong as it may be considered), sales catalogues are of two distinct sorts:

(a) Most sales catalogues (example, the noted Brookes,[5] 1828, catalogue) are intended as ephemeral documents addressed to an exceedingly limited audience; they are not on sale; and they are not documents intended as permanent records; therefore they are not zoological publication.

(b) In very exceptional cases (example, the first edition, 1798, of the Museum boltenianum) the sales catalogue appears to be utilized for the issuance and recording of scientific data. If placed on sale, it can be reasonably interpreted as zoological publication; if distributed *gratis* during the period when the exchange distribution of university theses reasonably met the demands of the profession, it can be reasonably interpreted as publication. But assuredly, if the Museum boltenianum were issued in 1927 (instead of 1798) and not placed on sale, it would not come within my conception of publication—even if it were sent to every conchologist in the world. In other words, a document like the Museum boltenianum seems to me essentially on the same status as a university thesis—publication in the period prior to 1800, but not in 1927. No sharp line can be drawn at a given date between 1799 and 1927; some cases must of necessity be decided more or less arbitrarily by a specially appointed jury. Let the jury agree or differ with me, I am prepared to accept the jury verdict, for I am a

[5] Brookes, 1828, Cat. Anat. and Zool. Mus. of Joshua Brookes, London, "a sales catalogue" ("Eighth days sale, Wed., July 23, 1828, at twelve o'clock").

firm believer in the legal maxim: *"Interest rei publicae ut sit finis litium"*—"it concerns the commonwealth (*publicus zoologicus*) that there be a limit to litigation [controversy]. Courts at law settle controversies about as frequently as they dispense justice, and some administrative decisions on cases of nomenclature and of publication are of necessity on this same general basis. Some court decisions are made on a very narrow margin which is subject to debate, and the same will always hold true in nomenclature and publication—but the important point is to obtain a decision and then accept it—in other words, "to play the game" with the profession.

(12) *Are society programs publication?* In answer to this question, I must use a witness's privilege in court, "Yes and no, and I will explain my answer."

The program of this meeting is free to everybody here, but it is not potentially and reasonably available to John Doe, protozoologist in Australia. Therefore, this sheet is not to be accepted as publication even were it to contain detailed abstracts of the papers presented.

But the moment this program is placed on permanent record in an annual volume offered for sale or in a journal, accepted as proper medium for publication, it becomes publication, and a new name thus printed would take date, *ceteris paribus,* as of the date of said journal—but not as of the date of this meeting.

Definition: On basis of the discussion thus far, but without expecting general agreement with me, I would define zoological publication theoretically as: *The manifolding of a dated zoological document which is intended as permanent record* and *which is made potentially and reasonably available to the populus zoologicus as of the decade of issue.*

The theoretical vs. the practical: While it is not difficult to point out certain theoretical factors in answer to the question assigned to me for discussion, the practical side of enforcing these factors is an entirely different question. Two very important principles in particular are to be considered, namely:

First: The basic question must always be considered, *"How much does it cost?* In other words, a practical application of theoretical ideals depends largely upon available funds. Economic conditions can not be escaped, and with the increased cost of printing the problem of finding prompt outlet for manuscript becomes increasingly more difficult. In absence of sufficient endowment and of adequate commercial returns to publishers, it is not unnatural that authors have followed directions of lesser resistance and have issued manuscripts under standards of manifolding which are not always ideal. If they did not know better, the fault is not theirs but that of their teachers; if they did know better, but did the best they could under the circumstances, should we not endeavor to improve the circumstances rather than blame the authors? *Why should not scientific journals be endowed, as well as university chairs, as permanent memorials to persons?* If any of you wish to establish a memorial of this kind to your parents or to a son or daughter, I feel quite confident that I can mention at least two worth-while serials which would welcome an endowment—and both of them need it very seriously.

Second: A rule, regulation or standard, voluntary as to adoption, is of practical value in so far as it has the approval of the *populus.* In this connection attention may be invited to the fact that the zoological profession is composed of specialists, therefore of individualists, who have an inherited idea that science must be free and untrammeled and who are occasionally somewhat inclined (I speak from personal experience in nomenclature) to resent decisions which are not in harmony with their own personal views. With all due respect I would good-naturedly invite attention to the fact that the words "freedom" and "disregard of propriety" are not synonyms.

The profession is not prepared to bow to the views of any one person, but I am persuaded that much good could be accomplished gradually if the International Zoological Congress would appoint a special "Commission on Principles and Practices of Publication" and assign to it the duty of studying this problem from the viewpoints of theory as well as from the practical economics existing in various countries, to determine in how far standards can be internationalized and in how far it would be feasible to reduce the present widespread waste (of publication space and subscription funds) by concentrating the present much-duplicated reviews into fewer journals, thereby releasing more much desired space for original contributions.

Such a commission could classify the current zoological publications in various groups, on a percentage basis or, let us say, as

Class A: Publications printed in or with summaries in certain languages, placed on sale, with a minimum edition of n copies, and with a free list of r copies at least x of which are sent abroad.

Class B: Publications placed on sale, printed in or with summaries in certain languages, with a minimum edition of n copies, but with no free list.

Class C: Publications printed in languages not ordinarily understood and with no summary in more generally understood languages.

Class D: Publications with editions composed of less than n copies.

Various combinations of important characters could be made and publishers would sooner or later endeavor to bring their works into the higher grades as defined

by the commission, while two or more periodicals would probably unite, in many cases, in order to improve their standards, and some of the struggling serials would probably die a natural death more promptly than occurs at present.

Further, the commission could hand down opinions in respect to cases in doubt as to whether a given document is or is not to be accepted as published.

Self-understood, it would take time to obtain practical results. Civilization was not made in a day, and important reforms are developed by evolution rather than by revolution. A campaign of education by the commission would, however, work up a general sentiment in the profession in favor of the view that for the good of science publications should line up to certain prescribed standards of "playing the game" with the profession.

I have sufficient faith in the zoological profession to feel that a systematic campaign of education by an international commission, authorized by the congress and carefully selected as respects its personnel, would accomplish more good in standardizing the *sine qua non* of zoological publications than will any amount of individual essays or debate dealing with this subject which, year by year, is becoming a more complicated, more serious and more practical subject.

C. W. STILES

U. S. PUBLIC HEALTH SERVICE

THE SEVENTH CRUISE OF THE NON-MAGNETIC YACHT "CARNEGIE"

THE non-magnetic yacht *Carnegie*, of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, resumed on May 1, from Washington, D. C., the magnetic and electric survey of the oceans. Thus the plans visioned in 1904 under the enthusiastic and energetic directorship of Dr. Louis A. Bauer for the world-wide magnetic and electric survey will be further realized and the results already obtained will be greatly enhanced. This work was begun during 1905 to 1908 on the chartered brigantine *Galilee* in the then magnetically unexplored Pacific under the command, respectively, of J. P. Pratt for the first cruise and of W. J. Peters for the second and third cruises. With the completion of the specially designed yacht *Carnegie* in 1909 the survey was continued with greater efficiency, because of non-magnetic construction of the vessel and of the steady evolution of suitable instruments and observational methods, in all oceans during 1909 to 1921 under the command, respectively, of W. J. Peters for cruises I and II, of J. P. Ault for cruises III, IV and VI, and of H. M. W. Edmonds for cruise V.

Cruise VII of the *Carnegie*, to continue for three years during 1928 to 1931, will cover all oceans and will add 110,000 miles to the total of 290,000 miles already traversed by the vessel's first six cruises. Besides continued magnetic and atmospheric-electric investigations as heretofore with improved apparatus, determinations of natural marine electric-currents will be attempted as well as an extensive schedule in physical and biological oceanography.

The proposed increase in program is made possible through the addition of two to the scientific personnel which will total eight men. These and their special fields of activity are: Captain J. P. Ault, commander and chief of scientific staff; Wilfred C. Parkinson, senior scientific officer, atmospheric electricity and photography; Oscar W. Torreson, navigator and executive officer, magnetism, navigation and meteorology; F. M. Soule, observer and electrical expert, magnetism and physical oceanography; H. R. Seiwell, chemist and biologist, oceanography; J. H. Paul, surgeon and observer, medical work, meteorology and oceanography; W. E. Scott, observer, navigation and commissary; Lawrence A. Jones, radio operator and observer, radio investigation and communication. The sailing staff will consist of 17 men, making the total number of men on board 25; of the sailing staff, A. Erickson, first watch officer, C. E. Leyer, engineer and F. Lyngdorf, steward, occupied similar positions during the entire two years of the *Carnegie's* last cruise.

The necessary reconditioning of the vessel was completed last summer at Hoboken, New Jersey. The proposed program requires a great amount of instrumental equipment. Many improvements have been made by the department's shop in the magnetic and atmospheric-electric apparatus used on cruise VI; chief among these are the arrangements for electromagnetic determinations of magnetic inclination and intensity and for photographic registration of atmospheric potential-gradient. The oceanographic equipment includes an improved type of Wenner's electrical salinity apparatus made in the department's shop, Richter and Wiese thermometers and water-bottles, Nansen water-bottles, special non-magnetic winch with 6,000-foot and 20,000-foot aluminum-bronze cables for depth-work, sonic depth-finder loaned by the United States Navy Department, chemical and biological apparatus, silk meter and half-meter plankton-nets, various types of bottom-samplers and necessary appurtenances. The meteorological instruments are in general of the recording type and a special program of observation and control has been arranged. At Plymouth and at Hamburg additional recording wet- and dry-bulb thermograph and

wet- and dry-bulb resistance-thermometer equipment with recording galvanometer for three stations at masthead, cross-tree and meteorological screen are to be installed.

The first leg of the cruise will be to Plymouth, England, where the vessel will arrive about the end of May. After a call at Hamburg the next ports of call will be at Iceland, at Barbados and at the Canal Zone (about the end of October, 1928). The balance of the cruise will cover the North Pacific, South Pacific, South Atlantic, Indian and North Atlantic oceans, and is planned to include ports of call at Easter Island, Callao, Papeete, Apia, Guam, Yokohama, San Francisco, Honolulu, Apia, Lyttelton, South Georgia, St. Helena, Cape Town, Colombo, St. Paul, Fremantle, Lyttelton, Rapa Island, Buenos Aires, St. Helena, Ponta Delgada, Madeira and Washington, D. C. (about September, 1931).

The preparations for this cruise have had generous cooperation and expert advice on all sides from interested governmental and private organizations and individuals both in America and Europe, who have also either loaned or presented much of the special oceanographic equipment and many books for the reference-library on board. Among these the Carnegie Institution of Washington is indebted to the following: United State Navy Department, including particularly its Hydrographic Office, Naval Research Laboratory, Signal Corps and Air Corps of the War Department, Coast Guard, National Museum, Bureau of Fisheries, Weather Bureau and Coast and Geodetic Survey; Scripps Institution of Oceanography of the University of California; Museum of Comparative Zoology of Harvard University; School of Geography of Clark University; American Radio Relay League; Geophysical Institute, Bergen, Norway; Marine Biological Association of the United Kingdom, Plymouth, England; German Atlantic Expedition of the *Meteor*, Institut für Meereskunde, Berlin, Germany; British Admiralty, London; Carlsberg Laboratorium, Bureau International pour l'exploration de la Mer, and Laboratoire Hydrographique, Copenhagen, Denmark, and many others. Dr. H. U. Sverdrup, of the Geophysical Institute at Bergen, Norway, research associate of the Carnegie Institution of Washington, is consulting oceanographer and physicist.

J. A. FLEMING

DEPARTMENT OF TERRESTRIAL MAGNETISM,
CARNEGIE INSTITUTION OF WASHINGTON

HARRIS HAWTHORNE WILDER

DR. H. H. WILDER, professor of zoology in Smith College since 1892, died suddenly in Northampton, Monday afternoon, February 27, 1928.

Dr. Wilder was born in Bangor, Maine, April 7, 1864, the son and only child of Solon Wilder, a musical director, and Sarah Smith Wilder, the daughter of a physician. In 1886 he graduated from Amherst College with the degree of A.B. He took the classical course in college, and the thorough grounding he received in Latin and Greek had an important influence upon his development as a scholar; the literary character of his scientific writings was throughout his life essentially scholarly. John M. Tyler was the professor of zoology at that time in Amherst, and his teaching and example were other powerful factors in the moulding of Wilder's tastes and habits of mind, in that they served to strengthen and develop a love for the natural sciences which had shown itself in him while still a young child and throughout his boyhood. After graduation he taught biology in one of the Chicago high schools for three years, and then, the impulse to make a special study of zoology and especially anatomy having become too strong to be longer resisted, he went abroad to pursue these subjects under Wiedersheim in the University of Freiburg. It was the beneficent influence of John Tyler, who had himself studied in Germany, which again became active in his interest and guided Wilder to Wiedersheim's laboratory.

His two-years' study-period with Wiedersheim and Weismann in Freiburg made a professional zoologist of Wilder, and gave him the technical and intellectual foundation and background of all his later work. He took the degree of Ph.D., *summa cum laude*, there in 1891. A mark of the breadth of his intellectual interests was the choice of medieval English as one of the minor subjects of his examination.

It was in Freiburg that Wilder's attention was first directed to anatomical studies in the Amphibia. This field of research was Wiedersheim's own special interest, in which he had first made his reputation as a comparative anatomist, and with his accustomed generosity towards his pupils he gave Wilder valuable material from his private collections for special study, while the latter was still a student under him.

The results of these researches were published in the *Zoologische Jahrbücher* in Wilder's first two papers, "Die Nasengegend von Menopoma," etc., and "A Contribution to the Anatomy of Siren lacertina." The skill with which he executed delicate dissections, his insight and often intuition in the interpretation of obscure anatomical structures, and the rare artistic talent shown in his drawings were all in evidence in these early productions. His interest in amphibian anatomy, thus auspiciously aroused, continued throughout his lifetime; his numerous contributions in this field of research and those of his colleagues

and pupils have been of great importance and have made his laboratory in Smith College known throughout the world as one of the most important centers of amphibian studies.

On his return to America in 1891 Wilder taught again for a year in Chicago, and then, through the influence of John Tyler, was appointed professor of zoology in Smith College.

The following year, in 1893, Wilder caused a genuine sensation among zoologists by the publication in the *Anatomischer Anzeiger* of "Lunglose Salamandriden," in which he shows that in one family of common salamanders both lungs and gills are entirely wanting in the adult animal. This important and very surprising fact had not been observed or suspected up to that time, although these animals had been studied by numerous investigators both in America and Europe. The outstanding student of Amphibia in America at that time was the veteran comparative anatomist, Edward Drinker Cope, who, when shown Wilder's paper, scoffed at it, saying he had been dissecting salamanders most of his life and had always found lungs in them. He was mistaken, however, as to the large family of the Plethodontidae, which have none.

About 1897 Wilder began to interest himself in the epidermic markings on the palms and soles of primates and especially the friction ridges of the human hand and foot. This development was quite in line with his general interest in human anatomy, which had been active in him from a very early period. In fact, while still a high-school teacher in Chicago he had done human dissecting on the side, and during his first year in Freiburg he had joined the medical students in their anatomy courses and made a complete dissection of the human subject. His studies of palms and soles broadened and developed as time went on, and his numerous contributions to the subject, together with those of his colleagues and pupils, and especially his wife, have been of fundamental importance in this field of research.

The comparison of the palms and soles of the two members of pairs of human twins led Wilder into the field of teratology, and in 1904 and 1908, respectively, there appeared in the *Journal of Anatomy* his important papers, "Duplicate Twins and Double Monsters" and "The Morphology of Cosmobia." Similar studies, as well as his interest in human anatomy, also took him into the field of physical anthropology, which he cultivated during his latter years. In 1920 he published the first American text-book on the subject, "A Manual of Anthropology."

Wilder's grasp of the details of both human and comparative anatomy as well as of anthropology, the philosophic cast of his mind and the originality of his genius, and also the command of a facile English style have been productive of several treatises of importance: "The History of the Human Body," 1910 and 1923; "Personal Identification" (with B. Wentworth), 1918; "Man's Prehistoric Past," 1923; and "The Pedigree of the Human Race," 1926.

Of these books the first and last named are perhaps the most important. They are both outstanding works of pronounced originality, which will long be standard authorities on the matters of which they treat. The "History of the Human Body" is a comparative anatomy of man, written especially for medical students but also for an educated laity. It is a philosophy of human structure, and is distinguished in so eminent a degree by adequacy and breadth of treatment, by clearness of exposition and by facility of expression that it has become a classic in its field. And "The Pedigree of the Human Race" is probably a work of equal merit, although it is of too recent publication to have had its appeal to an interested public fully tested.

Wilder's publications comprise seven published books and some thirty-nine papers which have appeared in scientific journals. He was a member of the following scientific societies: American Society of Naturalists, American Society of Zoologists, Boston Society of Natural History, Association of American Anatomists, American Anthropological Association, International Association for Identification, American Academy of Arts and Sciences, Société des Sciences, Agriculture et Arts du Bas-Rhin, and the Galton Society.

On July 26, 1906, Wilder took the most important step in his career when he married Inez Whipple, who had been for several years an instructor in his department. The partnership thus formed was an ideal one from every point of view. Mrs. Wilder, who was also, and still is, a productive zoologist, had similar scientific proclivities to his own and carried on her researches in similar fields; consequently, although she and her husband conducted their scientific activities independently of each other and worked on different problems, they could give each other mutually the assistance and support which their closely related interests made possible.

In other and still more important ways also was Wilder's marriage fortunate; it ensured to him a congenial and happy home life, and enabled him to indulge his love of society and of familiar social intercourse with his friends and pupils. It also provided him with a companion for his travels. Both he and his wife were very fond of travel, and they made many trips together to distant countries. Less than a year ago they returned from a trip around the world which had occupied the greater part of a

year. With Wilder, however, travel was not primarily a matter of sightseeing; he always felt that the most interesting and profitable aspect of it was the experience of meeting and knowing congenial people of other nationalities and races, and learning their point of view by actually living so far as possible, if only for a brief time, in their environment and manner. Thus he made numerous interesting contacts and warm friendships with scientific men and others in many parts of the world. As shown by the general tenor of the "Pedigree of the Human Race" he had developed a profound appreciation of the common humanity of all races and a belief in similar potentialities of all for intellectual and spiritual achievement.

The general public knows a scientific man by his published works and by his achievements in his chosen field of research, and H. H. Wilder will be long remembered. His family and friends, however, will think rather of other things when they look back on their association with him. They will remember the sweetness of his disposition, his modesty and gentleness, his gaiety and love of fun, the brightness of his wit and the brilliancy of his talk and his self-effacement when rewards and honors were being distributed. The many generations of Smith College students who sat under his teaching will recall the enthusiasm for his courses which he inspired in them, his vital concern for their welfare and progress and especially his hospitable home, where he loved to entertain and amuse them.

H. S. PRATT

HAVERFORD COLLEGE

SCIENTIFIC EVENTS

THE SECRETARIES' CONFERENCE OF THE AMERICAN ASSOCIATION AND AFFILIATED SOCIETIES

AT the second Toronto meeting of the American Association for the Advancement of Science, in December, 1921, was inaugurated a conference of the secretaries of sections and societies, together with members of the executive committee and some of the officers. A similar conference has been held in connection with each subsequent meeting of the association. Recently this conference has become organized as a standing committee of the association under the direction of the secretaries of sections and societies. Under the new plan the organization is permanent and is to be known as the Secretaries' Conference. It is planned that there shall be one or more sessions of the conference at each annual meeting and that the work of the conference will be carried on by correspondence in the interim.

The secretaries of the sections and societies are directly concerned with the details of arranging programs, rooms and the like, and they should be familiar with the needs of their own science groups. Efforts will be made by correspondence to determine some of the problems and questions which need study, and these will be made the topics for discussion at future sessions. It is expected that each secretary of a section or of a society will indicate modifications that seem desirable to make his sessions more successful, and that he will suggest possible changes that promise to lead to more satisfactory arrangements and procedure in general. There are numerous details which must be taken up anew each year by the local committees for the annual meeting and the combined experiences of the secretaries should be very valuable to the local committees as well as to the Washington office of the association. There might well be worked out by the secretaries' conference a series of directions to guide future committees in their work on arrangements for the meetings.

Some of the questions recently discussed in sessions of the secretaries' conference will give an idea of the problems which are still more or less unsolved. How may the scientific men themselves become better acquainted with the problems and work in other fields than their own? Will joint sessions or general papers on border-line questions be helpful? How may the interrelationships of different fields be presented to the general public so as to stimulate interest and support? How may room assignments be made to bring together related groups? How may the methods be improved for handling railway certificates, and facilitating the getting of return railway tickets and Pullman accommodations? What can be done to improve the procedure followed in making the award of the annual American Association prize? Can plans be worked out to develop the scientific side of the annual exhibition? Is there any way to reduce the great complexities that are more or less inherent in meetings of so many societies and groups?

It is hoped that some of these, or similar questions, may be arranged for study, report and discussion at the next session of the secretaries' conference in New York City next winter. The members of the conference will cooperate in this, and will welcome suggestions from others. The secretaries' conference might well become a sort of clearing-house for the consideration of the problems and questions arising in connection with the annual meetings of our scientific societies. Notes and suggestions may be addressed to the conference secretary.

GEORGE T. HARGITT,

Secretary of the Secretaries' Conference

LYMAN HALL, SYRACUSE UNIVERSITY,

SYRACUSE, NEW YORK

ANNUAL MEETING OF SCIENCE SERVICE

DR. WILLIAM E. RITTER was elected honorary president of Science Service at the annual meeting of the board of trustees of that organization held in Washington on April 26. This honor was conferred upon the occasion of Dr. Ritter's retirement this year as president and trustee of the organization for the formation of which he was largely responsible.

Science Service is the institution for the popularization of science organized under the auspices of the National Academy of Sciences, the National Research Council and the American Association for the Advancement of Science. The idea of the institution arose from the intellectual partnership of Dr. Ritter, formerly director of the Scripps Institution for Biological Research, with the late E. W. Scripps, newspaper proprietor, who furnished sufficient endowment to assure the institution's financial and intellectual freedom.

Dr. J. McKeen Cattell, editor of SCIENCE and psychologist, was elected president succeeding Dr. Ritter. Dr. Vernon Kellogg was reelected vice-president and chairman of the executive committee and H. L. Smithton, treasurer; Dr. David White and Marlen E. Pew, members of the executive committee, and Watson Davis, secretary.

Two new members of the board of trustees were elected at this meeting: H. L. Smithton, of Cincinnati, Ohio, as a representative of the E. W. Scripps estate, and Dr. Harrison E. Howe, editor of *Industrial and Engineering Chemistry*, Washington, D. C., as a representative of the National Research Council.

Annual reports presented by Dr. Edwin E. Slosson, director, and Watson Davis, managing editor, revealed that the past year has been one of progress for the institution. Its syndicate services are now used by some two hundred publications. The daily news report of Science Service reaches nearly a hundred daily newspapers and other publications. One fifth of the total daily circulation of the American press is reached by Science Service features. A substantial growth of the *Science News-Letter*, Science Service's weekly magazine, both in prestige and financially, was reported.

During the past year Science Service's service to newspapers has been extended to all of the twenty-six Scripps-Howard newspapers and arrangements have also been made to supply this important group of newspapers with a daily telegraphic news service. This service and other features have been extended to many other newspapers. Other activities of Science Service, such as the providing of magazines with periodical articles, the offering of lectures, the editing of books for prominent publishers and the establishment of collections of scientific photographs and information, have been extended in scope.

One of the matters given serious consideration at the annual meeting was cooperation with the Social Science Research Council in expanding the activities of the institution into the field of the social sciences. Plans and prospects for a Science Service Building are also receiving the attention of the trustees and officers of the institution.

The board of trustees as elected at the annual meeting is as follows: Representing the American Association for the Advancement of Science, J. McKeen Cattell (president) editor of SCIENCE, Garrison, N. Y.; D. T. MacDougal, director of the Desert Laboratory, Tucson, Ariz.; M. I. Pupin, professor of electromechanics in Columbia University, New York City. Representing the National Academy of Sciences, John C. Merriam, president of the Carnegie Institution of Washington; R. A. Millikan, director of the Norman Bridge laboratory of physics, California Institute of Technology; Dr. David White, senior geologist, U. S. Geological Survey. Representing National Research Council, Vernon Kellogg (vice-president and chairman of executive committee), permanent secretary, National Research Council, Washington, D. C.; C. G. Abbot, secretary of the Smithsonian Institution, Washington, D. C.; Harrison E. Howe, editor of *Industrial and Engineering Chemistry*. Representing journalistic profession, John H. Finley, associate editor, New York *Times;* Mark Sullivan, writer, Washington, D. C.; Marlen E. Pew, editor of *Editor and Publisher,* New York City. Representing E. W. Scripps estate, Harry L. Smithton (treasurer), Cincinnati, Ohio; Robert P. Scripps, Scripps-Howard newspapers, West Chester, Ohio; Thomas L. Sidlo, Cleveland, Ohio.

WATSON DAVIS,
Secretary

REPORT OF THE HENRY DRAPER COMMITTEE OF THE NATIONAL ACADEMY OF SCIENCES

THE Henry Draper Committee respectfully recommended to the council of the academy that the Draper Gold Medal for the year 1928 be awarded to William Hammond Wright, astronomer in the Lick Observatory, University of California, for the reasons here expressed:

Coming to the Lick Observatory in 1897, Mr. Wright at first participated in the program of radial velocity measurements which had been initiated by Dr. W. W. Campbell. To his ability as an engineer are due several improvements in the mounting and adjustment of the spectrograph that added greatly to its efficiency as a

measuring instrument of precision. These features have been adopted in the design of practically all later spectrographs used in stellar radial velocity determinations.

Assigned to the duty of initiating the work of the Chile station of the Lick Observatory, he went to Santiago early in the year 1903 and within six months of the day of landing at Valparaiso, selected and secured the site for the observatory, erected the dome and telescope and began the actual work of securing spectrograms of the southern stars. He conducted the work of this station for nearly three years with distinguished success.

Returning to Mount Hamilton in 1906, he devoted the years to 1924 chiefly to spectrographic studies of the nebulae and of the novae. The former led, among other results, to the accurate measurement of the wave-lengths of the nebular lines, including some not previously reported; to the detection of the presence in the gaseous nebulae of the continuous emission of hydrogen, beginning abruptly at the end of the Balmer series, and extending into the ultra-violet; to the recognition of the remarkable variety of forms corresponding to the different nebular lines in the planetary nebulae; to the discovery that the nuclei of the planetary nebulae give a continuous spectrum strong in ultra-violet light, indicating that they are at a very high temperature, and to the conclusion that the nuclei of such nebulae are to be classed with the O-type stars. Some of these results were important factors in Bowen's recent brilliant work on the nature of nebulium.

Wright's studies of the novae can not be summarized briefly; it must suffice to say that they are more comprehensive and penetrating than those of any other investigator, covering in several cases the entire range of the spectrum and the entire known history of the star.

Since 1924 Mr. Wright has devoted his time largely to the photographic study of planetary detail, as revealed by plates sensitive to light of different colors, from the ultra-violet to the infra-red. This work is unquestionably the most significant and promising advance that has been made in the study of the planets in recent years, and has already resulted in important contributions to our knowledge of conditions on Mars and Jupiter.

Any one of these researches would in itself entitle Mr. Wright to recognition as one of the leading students of astrophysics; taken together they fully justify the award now made to him.

No grants of Draper funds in support of research in the field of astronomical physics have been made in the current year. The unexpended balance from the income of the Draper Foundation, available for this purpose, is $508.63.

Respectfully submitted,

W. W. CAMPBELL, *Chairman*

APRIL 3, 1928

APPOINTMENTS OF THE CARNEGIE INSTITUTION OF WASHINGTON

RECENT appointments of the Carnegie Institution of Washington include the following:

Dr. R. J. Havighurst, assistant professor of chemistry, Miami University, Oxford, Ohio, fellow of the Carnegie Institution of Washington in the history of science for the year beginning September 1, 1928, to enable Dr. Havighurst to undertake special studies in cooperation with Dr. George Sarton, associate in the history of science.

Dr. Wm. A. Heidel, Wesleyan University, research associate of the Carnegie Institution of Washington, for the period from July 1, 1928, to December 31, 1931, for the purpose of enabling Dr. Heidel to continue his studies on a comprehensive and critical history of early Greek thought, with special reference to its philosophical and scientific aspects.

Dr. Hubert L. Clark, Museum of Comparative Zoology of Harvard University, research associate of the Carnegie Institution of Washington, for the purpose of undertaking further studies of the echinoderm fauna of North Australia with a view particularly to interpretation of continental connections.

Dr. Henry E. Crampton, Columbia University, continuation of appointment as research associate of the Carnegie Institution of Washington, for the purpose of undertaking further studies of organic differentiation in nature as illustrated by land snails belonging to the genus Partula. Field studies will be undertaken especially in the Caroline and Pelew Islands, and it is hoped that further evidence may be obtained which may bear directly upon the problem of a pre-Pacific continent. Funds were provided for this study by Carnegie Corporation of New York.

Dr. Harald U. Sverdrup, Geophysical Institute, Bergen, Norway, research associate of the Carnegie Institution of Washington, for cooperation with the department of terrestrial magnetism of the institution in connection with development of a program for oceanographic studies during the forthcoming cruise of the non-magnetic yacht *Carnegie*.

SCIENTIFIC NOTES AND NEWS

DR. EDGAR F. SMITH, emeritus professor of chemistry at the University of Pennsylvania and formerly provost of the university, died on May 3 in the seventy-fourth year of his age.

PROFESSOR EDMUND BEECHER WILSON, of the department of zoology at Columbia University, has been awarded the gold medal of the Linnean Society of London. The presentation will be made in London on May 24 at the anniversary meeting of the society.

DR. LIBERTY H. BAILEY and Dr. W. R. Whitney were presented with the gold medals of the National Institute of Social Sciences on May 3. Dr. John Merle Coulter, adviser of the Boyce Thompson Institute for Plant Research, presented the medal to Dr. Bailey, who formerly was director of the State College of Agriculture at Cornell University. It was bestowed in recognition of "distinguished social service in the

solution of human and scientific problems relating to rural life in America." The presentation to Dr. Whitney was made by General John J. Carty, vice-president of the American Telephone and Telegraph Company, in recognition of "distinguished service in promoting and leading electrical research, with its widespread favorable reaction upon human progress."

THE gold medal for science of the Society of Arts and Sciences of New York has been awarded to Thomas A. Edison and will be presented at a dinner at the Hotel Astor, New York, on May 24. Mr. Walter Russell, president of the society, will preside and Dr. E. E. Slosson, of Science Service, will be toastmaster.

AT the Washington meeting of the American Association of Physicians, presentation of the de Roaldes medal "for distinguished service to the science of medicine" to Dr. Chevalier Jackson, noted laryngologist of Philadelphia, was made on behalf of the Laryngological Society by Dr. Herbert S. Birkett, of Montreal. The association also conferred the George M. Kober medal on Dr. Victor C. Vaughan, of the University of Michigan.

P. H. ROYSTER, associate chemical engineer, fertilizer and fixed nitrogen investigations, U. S. Department of Agriculture, has been given the 1928 Johnson award, made by the American Institute of Mining and Metallurgical Engineers to "some promising engineer, not over forty years of age, because of meritorious research, invention or contribution to the professional literature of iron and steel along the lines of blast-furnace process."

DR. E. F. ARMSTRONG, managing director of the British Dyestuffs Corporation, Ltd., has been elected a member of the Athenaeum Club for distinguished eminence in science.

AT the annual dinner of the British Society of Dyers and Colorists, held in Manchester on March 23, the Perkin medal was presented to Dr. R. E. Schmidt, of Elberfeld, for "his remarkable work on anthraquinone and allied bodies, which has led to the discovery and commercial production of a whole series of fast dyestuffs."

DR. ALEXANDER BEHM, professor of physics in the University of Kiel, has been awarded the gold medal by the Union pour la Sécurité en Aéroplane, Paris.

DR. KONRAD E. BIRKHAUG, assistant professor of bacteriology at the school of medicine in the University of Rochester, was recently elected to honorary membership in the Norwegian Royal Medical Society at Oslo.

AT the meeting of the Royal College of Physicians of London, held on April 2, Sir John Rose Bradford, F.R.S., was reelected president.

L. H. ADAMS, of the Geophysical Laboratory of the Carnegie Institution, has been appointed secretary of the central petroleum committee of the National Research Council, which acts as adviser of the American Petroleum Institute in expending the funds for fundamental research on petroleum donated by John D. Rockefeller and the Universal Oil Products Company.

DR. JAMES J. DURRETT, formerly professor of public health at the University of Tennessee, is to succeed Dr. George W. Hoover in charge of drug control in the food, drug and insecticide administration, U. S. Department of Agriculture.

LOUIS O. SORDAHL, research assistant in physics at the University of Wisconsin, has been appointed field director of the Smithsonian Institution's station for the study of solar radiation at Mount Brukkaros, Africa.

THE department of mathematics at the University of California will have as visitors on its faculty for the coming summer session Constantine Carathéodory, professor of mathematics at the University of Munich, Germany, and H. B. Phillips, professor of mathematics at the Massachusetts Institute of Technology.

HERBERT W. KRIEGER, curator of ethnology in the U. S. National Museum, has returned from Santo Domingo, bringing many specimens from ancient village sites around Samana Bay.

HENRY B. COLLINS, JR., has left Washington for Alaska, where he will carry on archeological and ethnological explorations on St. Lawrence Island and the coast of Seward Peninsula under the auspices of the Smithsonian Institution.

DR. GERRIT S. MILLER, Jr., curator of the division of mammals in the U. S. National Museum, recently arrived in Sanchez, Dominican Republic, where he will spend the next few months investigating the caves of the region for bones of the extinct fauna of the island.

DR. GEORGE T. MOORE, director of the Missouri Botanical Garden, addressed the students of the American University in Cairo, Egypt, on April 3 on "Some of the Activities of the Missouri Botanical Garden."

ON April 21, Dr. Davidson Black, professor of anatomy in the Peking Union Medical College, China, delivered an address to the Royal Canadian Institute on "Man's Origin from the Standpoint of Zoogeography."

A LECTURE before the science seminar of the Agricultural and Mechanical College of Texas, entitled "Measuring Distances of Stars," was given on April 30 by Dr. H. Y. Benedict, president of the University of Texas. On May 21 Dr. E. A. Lovett, president of Rice Institute, will address the science seminar on "Influence of Progress in Pure Science on Human Welfare."

DR. FRANCIS G. BENEDICT, director of the nutrition laboratory, lectured on "Basal Metabolism: The Modern Measure of Vital Activity" at the Carnegie Institution of Washington in Washington, D.C., on April 18, and at Teachers College, Columbia University, and at Wesleyan University, Middletown, Connecticut, on April 27.

DR. CHARLES G. ROGERS, professor of comparative physiology in Oberlin College, delivered a lecture before the biological students of DePauw University on April 5 on the subject "Physiological Evidences of Animal Relationships."

DR. MICHAEL F. GUYER, professor of zoology at the University of Wisconsin, addressed the regular monthly meeting of the University of Cincinnati section of the Society of the Sigma Xi on April 20, when he spoke on "Democracy as a Biological Problem."

ON April 28, Dr. Chas. N. Gould, director of the Oklahoma Geological Survey, delivered an address before the North Texas Geological Society at Wichita Falls, Texas, on "Geology in Oil Finding."

DR. CHARLES A. SHULL, professor of plant physiology at the University of Chicago, is spending the spring quarter at West Virginia University. He is engaged in research and writing. On April 23 he addressed the botany seminar and on April 27 he delivered an address before the Society of Sigma Xi. He expects to make during the quarter trips to several neighboring institutions, one of these being Pennsylvania State College, where he will deliver an address entitled, "The Foundation of Experimental Plant Physiology: The Life and Work of Stephen Hales."

DR. HAVEN EMERSON, professor of public health administration at the College of Physicians and Surgeons, Columbia University, gave the Adolph Gehrmann lectures at the college of medicine of the University of Illinois on April 23, 24 and 25.

DR. IRVING LANGMUIR, assistant director of research of the General Electric Company, Schenectady, N. Y., gave a series of three public lectures on the evenings of April 30, May 1 and 2, under the auspices of the Carnegie Institute of Technology of Pittsburgh. His subject was "Electrical Discharges in Gases at Low Pressures." This series concluded the program of public lectures arranged by the Carnegie Institute of Technology for the benefit of residents of the district.

DR. GEORGE BARGER, professor of chemistry in relation to medicine in the University of Edinburgh, gave the fifth course of the Charles E. Dohme lectureship at the Johns Hopkins University on May 7, 8 and 9 on the general subject of ergot. On May 17 he will lecture on "The Chemistry of Hormones" and on May 18 on "The Chemistry of Thyroxine" at Buffalo, under the auspices of the Fenton Foundation and the Sigma Xi Club of the University of Buffalo.

THE Cambridge University Press announces for early publication a volume of essays and addresses by the late William Bateson, F.R.S., edited, with a memoir, by Mrs. Bateson.

ON February 14 the governor of the Falkland Islands unveiled the memorial over the grave of Sir Ernest Shackleton at Grytviken, South Georgia, which had been sent out in a whaling steamer by Lady Shackleton. It is a massive piece of sculpture in Scotch granite.

MEMORIAL services for the late Dr. Thomas Forsyth Hunt, former dean of the College of Agriculture of the University of California, who died one year ago, were held on the university campus on April 22. Dean E. D. Merrill, of the college of agriculture, was chairman at the exercises and the speakers included Chester Rowell, representing the regents of the university; Vice-president R. G. Sproul, of the university, for the administration; Dr. H. J. Webber, director of the Citrus Experiment Station and former dean of the college of agriculture, representing the college, and R. E. Barrett, of Pasadena, senior student in agriculture, representing the students.

DR. CYRUS C. ADAMS, of New York, geographer and formerly associate editor of the *Bulletin* of the American Geographical Society, has died in his seventy-ninth year.

DR. JOHN SMITH DEXTER, professor of zoology in the University of Porto Rico, died on April 19 at the age of forty-two years.

PROFESSOR THEODOR CURTIUS, emeritus professor of chemistry in the University of Heidelberg, died at Heidelberg on February 9 in his seventy-first year.

THE deaths are also announced of Dr. Bernhard Wanach, professor of astronomy at the Geodetic Institute in Potsdam, and of Dr. Theodore Zincke, professor of chemistry in the University of Marburg.

THE alumni members of Sigma Xi at the University of Alabama met on April 24 and organized a Sigma Xi club. The club elected the following officers: Dr.

Emmett B. Carmichael, *president;* Dr. George I. Adams, *vice-president,* and Dr. W. P. Ott, *secretary and treasurer.*

THE Society for Experimental Biology and Medicine, at its annual meeting on April 18, announced the election of the following general officers of the society: *President,* Stanley R. Benedict; *vice-president,* Peyton Rous; *secretary,* A. J. Goldforb; *council,* O. F. Avery, John Auer, W. R. Bloor, Robert Chambers, Alfred E. Cohn, Irving Hardesty, Alfred F. Hess, A. S. Loevenhart, A. B. Luckhardt, William Ophuls, W. W. Palmer, O. H. Plant, F. H. Scott, H. D. Senior and Hsien Wu.

AT the annual meeting of the Boston Society of Natural History, held on May 4, the following officers were elected for 1928–29: *President,* Charles H. Taylor; *vice-presidents,* Nathaniel T. Kidder, Frederic T. Lewis, Glover M. Allen; *secretary,* Francis Harper; *treasurer,* Augustus P. Loring, Jr.; *trustees,* Thomas Barbour, Joseph A. Cushman, Laurence B. Fletcher, Frederic H. Kennard, W. Gordon Means and John C. Phillips. At the same meeting the annual Walker prizes in natural history, which were offered this year for the best papers submitted on any subjejct in the field of botany, were awarded as follows: a first prize of one hundred dollars to Chandrakant G. Kulkarni, of the University of Michigan, for a manuscript entitled "Meiosis in the Pollen Mother Cells of Some Strains of *Oenothera pratincola* Bartlett"; a second prize of fifty dollars to Miss Lydia B. Walsh, of Wellesley College, for a manuscript entitled, "Microsporogenesis in Petunia."

THE committee on scientific research of the American Medical Association has recently made a grant of $2,000 to Professor A. S. Warthin, of the department of pathology, and Professor George R. La Rue, of the department of zoology, of the University of Michigan, to permit them to continue their studies on the broad tapeworm of man. A grant of $500 has been made to Dr. K. E. Birkhaug, assistant professor of bacteriology at the University of Rochester, for the study in European clinics of bacterial allergy in rheumatic fever patients.

THE thirty-eighth annual meeting of the Nebraska Academy of Sciences was held on April 26, 27 and 28 at Midland College, Fremont, jointly with the Nebraska section of the Mathematics Association of America. Dr. W. D. Crouse, professor of physics at Midland College, is president of the academy. Chairmen for the sectional meetings were: biology, Professor C. J. Shirk, Nebraska Wesleyan; chemistry, Professor A. C. Rice, Grand Island; earth sciences, Professor E. F. Schramm, University of Nebraska; engineering, Professor Jiles W. Haney, University of Nebraska; mathematics, Professor W. C. Brenke, University of Nebraska; physics, Professor Chalmer N. Patterson, Hastings; social sciences, Professor C. K. Burkholder, Midland; high school teachers, Grant L. Stahly, Hastings High School.

THE Utah Academy of Sciences held its twenty-first annual meeting at the Hotel Newhouse, Salt Lake City, on April 20 and 21, under the presidency of R. A. Hart, of the Western Clay Products Association. The program consisted of eight addresses. The following officers were elected: Dr. Joseph F. Merrill, Salt Lake City, *president;* Dr. Willard Gardner, Logan, Utah, *first vice-president;* Dr. Walter D. Bonner, Salt Lake City, *second vice-president;* Dr. Bert L. Richards, Logan, Utah, *councilman;* Dr. O. W. Israelson, Logan, *councilman;* Dr. S. Y. Cannon, Provo, *councilman;* Dr. Vasco M. Tanner, Provo, Utah, *secretary-treasurer.*

THE Tennessee Academy of Science met at the University of Tennessee on April 20 for its twenty-second meeting. Dr. Walter S. Leathers, of Vanderbilt University, presided at the sessions on the first day, at which twelve scientific papers were read. A dinner was held in the evening at which W. F. Pond, state geologist, gave the principal address on "Contributions of Geological Surveys to State Development." The following two days were spent on a field trip to Mt. LeConte, Gatlinburg.

UNIVERSITIES in the middle west will be represented at the third annual meeting of the Midwestern Psychological Association at the University of Wisconsin on May 11 and 12 at which a series of symposiums, informal discussions and addresses will be on the program, according to an announcement by Professor C. L. Hull, in charge of local arrangements. Speakers and chairman of discussion groups include Professor M. F. Meyer, University of Missouri; Professor J. R. Kantor, University of Indiana; Professor Harvey A. Carr, University of Chicago; Professor A. R. Gilliland, Northwestern University, and Professor Hull.

A GEOLOGICAL conference has been called to meet at Norman, Oklahoma, on May 19 by R. C. Moore, of Kansas, E. H. Sellards, of Texas, and Chas. N. Gould, of Oklahoma, to discuss the problem of the Pennsylvanian of the Great Plains. It is expected that the state geologists of Iowa, Nebraska, Kansas, Missouri, Arkansas, Texas and Oklahoma will be present and participate in the discussion, also a number of paleontologists residing in the region, as well as representatives of a number of geological societies.

DR. HOWARD A. KELLY, of Baltimore, has presented to the herbarium of the University of Michigan his mycological library to be called the "Louis C. C. Krieger Library and Collections." The library alone contains about 100,000 items and nearly all the older classical mycological literature, brought together during the last ten years. Included are 350 paintings by Krieger, many photographic prints, about 2,000 collections of fungi and a set of wax models. The collection will be housed in the herbarium quarter of the new museum building at Ann Arbor.

THE late Chandler Robbins, retired merchant and one of the founders of the American Geographical Society, has left $30,000 to the society.

GIFTS and pledges of $1,215,810 have been received towards the $2,000,000 fund which the Museum of the City of New York seeks to raise for building purposes by June 1, the date set to qualify for the offer of a city-owned plot at Fifth Avenue and 103d Street.

THE American Pharmaceutical Association has available a sum amounting to $550 which will be expended after October 1 for the encouragement of research. Investigators desiring financial aid in their work will communicate before July 1 with H. V. Arny, chairman, A. Ph. A. Research Committee, 115 West 68th Street, New York City, giving their past record and outlining the particular line of work for which the grant is desired.

PROFESSOR HENRY E. CRAMPTON, of Barnard College, Columbia University, associate of the Carnegie Institution of Washington, will leave New York on June 1 on an eight months' expedition to the islands of the western Pacific Ocean, under the auspices of the Carnegie Institution. During eight earlier field-journeys he has prosecuted studies on the variation, distribution and evolution of certain land organisms living in the islands of the South Pacific Ocean, from the Society and Cook Groups to Samoa and the Mariana Islands. It is now planned to extend these studies to the larger and higher members of the Caroline Islands, Palao Islands and Yap, in order to bring the western Pacific area into the entire scheme of the research. Professor Crampton will be assisted in the field-work by his son, Mr. Henry E. Crampton, Jr., and by Mr. Richard B. Goetze.

AN expedition of Italian scientific men to explore the upper reaches of the Amazon River is being organized at Padua, with the technical preparation of a large group of men. It is intended to study the flora and fauna and the lives of the natives. The expedition hopes to leave by the end of June. The venture is backed by the local press and popular subscription.

UNIVERSITY AND EDUCATIONAL NOTES

LAFAYETTE COLLEGE has received from Mr. Fred Morgan Kirby, of Wilkes-Barre, the gift of a building to house the department of civil rights which is expected to cost about $200,000.

DR. F. D. FROMME, professor of botany and plant pathology at the Virginia Polytechnic Institute and plant pathologist at the Virginia Agricultural Experiment Station, has been elected dean of the college of agriculture and director of the Agricultural Experiment Station of West Virginia University.

J. BURNS READ, assistant manager of the research department of the Metals Exploration Company, Golden, Colo., has been appointed professor of mining engineering at the Colorado School of Mines, in the place of Dean L. S. Grant, who recently resigned.

DR. ERNEST O. LAWRENCE, assistant professor of physics at Yale University, has been appointed as associate professor of physics at the University of California.

NEW appointments to professorships at Yale University include Dr. William Arthur LaField, who becomes clinical professor of radiology; Dr. Joseph Irving Linde, who is promoted from associate clinical professor to clinical professor of pediatrics, and Dr. Donald Wallace Porter, who is also promoted from associate clinical professor to clinical professor of pediatrics.

DR. RONALD MANSFIELD FERRY has been promoted to be assistant professor of biochemistry at the Harvard Medical School. Noel Ewart Odell, of the Mount Everest expedition, has been appointed lecturer on geology in the university.

DR. CHESTER K. WENTWORTH, formerly of the geology department of the University of Iowa, has been appointed associate professor of geology at Washington University, St. Louis.

DR. C. H. RICHARDSON, professor of mathematics at Georgetown College, Kentucky, has been appointed head of the department of mathematics at Bucknell University to take the chair formerly filled by Dr. W. C. Bartol, who retires after forty-seven years of teaching service.

PROFESSOR PASCAL, of the University of Lille, has been appointed professor of chemistry at the University of Paris to take the place of the late Professor Chabrié.

DR. FRIEDRICH ALVERDES, professor of zoology in the University of Halle, has been appointed to the chair of zoology in the University of Marburg.

DR. WILHELM STEINHAUSEN, of the University of Frankfort, has been appointed to the chair of physiology at the University of Greifswald.

DISCUSSION AND CORRESPONDENCE

DOES THE AMOUNT OF FOOD CONSUMED INFLUENCE THE GROWTH OF AN ANIMAL?

UNDER the above title H. H. Mitchell[1] has recently published a general criticism of certain types of nutrition studies. In the course of his argument he refers to several papers from this laboratory (without specifically naming the authors) as illustrations of what he says appear "to represent an exaggeration of the importance of negative experimental results." In this category he places our findings that arginine and histidine are not interchangeable in metabolism.[2,3] His objection to our conclusions appears to be due to the fact that the animals which received arginine in the absence of histidine ingested less food than those which received histidine in the absence of arginine. We are convinced that the diminished food consumption of the arginine animals was *the result of the dietary inadequacy.* Such evidence as is available indicates the correctness of this conception. Sixteen years ago F. G. Hopkins[4] pointed out that when a deficiency occurs, the failure in appetite *follows* the failure in growth; which was interpreted by him as indicating that the latter is the *causal* factor, and the diminished food consumption merely the *result* of the inhibited synthetic processes. He says, "If then a factor or factors essential to growth be missing from, or deficient in, a dietary, the consequent arrest of, or diminution in, growth energy may diminish the instinctive consumption of food, while the supply of such factors may increase consumption as an indirect result of a direct effect upon growth." A similar conclusion was reached by Osborne and Mendel[5] in a study of the supplementing influence of yeast upon artificial diets. They state, "The food consumption of the rats on the smaller quantities of yeast was less than that of those on the larger quantities, because their growth was slower and consequently they needed less food; and the change from a small quantity of yeast to a larger one was followed by growth with a resultant increase in food intake."

The above quotations show clearly that the investigators in question regard the diminished food consumption of animals on inadequate diets as the *result* of the failure in growth. No one will deny that, within certain limits, an animal which ingests a liberal amount of an *adequate* food will increase in weight more rapidly than one which consumes a smaller quantity, but this fact is not incompatible with the mass of evidence which has been accumulated, indicating that the ability or inability of an animal to grow upon a given diet exerts a profound influence upon food consumption.[6] Indeed, so generally is this correlation observed that Osborne and Mendel[7] remarked several years ago, "It is a common experience that animals living on unsuitable diets tend to reduce their food intake." Evidently, therefore, the conclusions in our arginine-histidine experiments were arrived at by application of exactly the same principles employed by others in proving dietary deficiencies.

Acceptance of the doctrine that in a young animal growth is an indication of dietary adequacy, and failure of growth a characteristic having the converse significance, is regarded by Mitchell as evidence of amazing credulity since it involves, he says, belief in "the infallibility of the animal appetite." The writer doubts whether any one believes that appetite is infallible. The use by the human subject of various materials which do not contribute to nutritive well-being is quite sufficient to exclude such a view should one be disposed to adopt it. Appetite is a more or less imperfect (and therefore not infallible) response to a physiological need, but when an added dietary component leads to an appetite stimulation the explanation is to be found, we believe, in *the influence exerted by the substance upon the cells themselves.* In the words of Hopkins,[4] "any effect of the addendum upon appetite must have been secondary to a more direct effect upon growth processes." *Thus our view places the emphasis upon the cell processes* rather than upon the imperfect outward manifestations. It recognizes the fundamental and irrefutable fact that the animal organism is unerringly accurate in its syntheses. If a tissue is to be formed at all, every component required must be available or capable of being manufactured by the cells; otherwise the synthesis will not occur. If growth follows the

[1] Mitchell, H. H., SCIENCE, 1927, lxvi (December 16), 596.

[2] Rose, W. C., and Cox, G. J., *J. Biol. Chem.*, 1924, lxi, 747.

[3] Rose, W. C., and Cox, G. J., *J. Biol. Chem.*, 1926, lxviii, 217.

[4] Hopkins, F. G., *J. Physiol.*, 1912, xliv, 425.

[5] Osborne, T. B., and Mendel, L. B., *J. Biol. Chem.*, 1917, xxxi, 149.

[6] A few of the many contributions showing this fact, and involving both vitamine and amino acid deficiencies are, Osborne and Mendel, *J. Biol. Chem.*, 1915, xx, 351, and 1916, xxv, 1; Karr, *ibid.*, 1920, xliv, 255; Cowgill, *Am. J. Physiol.*, 1921, lvii, 420; and Jackson, *J. Biol. Chem.*, 1927, lxxiii, 523.

[7] Osborne, T. B., and Mendel, L. B., *J. Biol. Chem.*, 1920–21, xlv, 277.

addition of an essential constituent to an inadequate diet, it does so because cell reactions which could not proceed in the absence of the added factor are now made possible. We believe that as the growth syntheses occur, the demand for raw materials is reflected in a stimulation of the appetite resulting in greater food consumption. It is difficult to see why such a view is unreasonable, or necessitates great gullibility for its acceptance. Furthermore, if food intake is not influenced by the adequacy of the ration it is a remarkable coincidence that of our histidine- and arginine-fed rats not a single one inadvertently made the mistake of eating more or less food than the other members of its group.

Mitchell also criticises in a similar fashion several papers dealing with the possibility of replacing essential amino acids (cystine and histidine) with synthetic compounds. It is scarcely necessary to defend these papers, inasmuch as no experimental data have been adduced indicating that our findings are incorrect. Suffice it to say that we are still of the opinion that taurine is "totally incapable" of replacing cystine in the diet for purposes of growth,[8] nor do we know of any reason for abandoning the conclusions expressed in the original publications regarding the availability of synthetic imidazoles.[9]

Mitchell cites the work of Lewis and Root[10] upon the replacement of lysine by nor-leucine as an example of a properly conducted experiment, in which the alterations in food consumption inherent in our investigations do not occur. If one calculates the average daily food consumption of Lewis and Root's rats, as may be done readily from the information supplied in the paper, it becomes evident immediately that *the foods were not consumed in equal amounts.* On the contrary, as would be expected, the change from an inadequate (gliadin) to an adequate (gliadin plus lysine) diet *was followed invariably by an increase in average daily food consumption. Supplementing gliadin with nor-leucine led to no appreciable change in food intake because both rations were equally inadequate for growth.* Furthermore, it must not be forgotten that gliadin contains some lysine. Were it completely devoid of this amino acid, the addition of the latter would lead to even greater alterations in food consumption than those observed. The experiments of Lewis and Root are comparable to our taurine investigations, in which the basal diet was not completely devoid of cystine. The magnitude of the changes in food consumption is of the same order in the two studies. There can be no reasonable doubt of the correctness of Lewis and Root's conclusions regarding the inability of nor-leucine to replace lysine, but the implication of Mitchell that there were no alterations in food consumption with the different types of diets is not in accord with the facts.

WM. C. ROSE

LABORATORY OF PHYSIOLOGICAL CHEMISTRY,
UNIVERSITY OF ILLINOIS

[8] Rose, W. C., and Huddlestun, B. T., *J. Biol. Chem.*, 1926, lxix, 599.

[9] Cox, G. J., and Rose, W. C., *J. Biol. Chem.*, 1926, lxviii, 781.

[10] Lewis, H. B., and Root, L. E., *J. Biol. Chem.*, 1920, xliii, 79.

THE SIBERIAN METEORITE

IN view of recent newspaper reports regarding a great meteorite supposed to have fallen in Siberia, I am sending you the following rather free translation of Mr. L. Kulik's story as it originally appeared in Russian.

From the two newspaper articles by Mr. L. Kulik, which you gave me, I have been able to obtain the following information concerning the so-called "Tungusk meteorite."

The appearance at 7 o'clock in the morning on June 30, 1908, of a "fiery body" of unusual brightness, rolling across the sky out of the north east and falling down in the "taiga" between the Yenissei and Lena Rivers, north of the Railroad line, was observed by a great number of people, mostly the native inhabitants, living in the basins of these rivers.

The fall of the meteorite was instantly followed by a column of fire rising skyward, by the formation of the heavy black clouds, and by a most deafening, resounding noise far surpassing in its magnitude, any thunderstorm, or artillery cannonade. This was heard for hundreds of kilometers within a radius of the cities of Yenisseisk, Krasnoyarsk, Kansk, Nijneudinsk, and Kirensk on Lena.

A terrific air-wave was formed which pushed ahead everything that it met in its way. The water in all rivers, lakes and streams was raised up; people and animals were lifted by it and carried along.

The vibrations produced by the fall of the meteorite were detected and registered by the seismographs of the Physical Observatory at Irkutsk, where Mr. A. V. Vesnesenski, who was in charge of the observatory, calculated the epicenter of the "earthquake" to be located in the upper part of the Podkamennaya Tunguska.

The phenomenon produced considerable panic, especially among the natives living in the basins of the Yenissei and all the various Tunguska Rivers, and adjacent part of the Lena River basin.

Several attempts, made in 1908, to find the body of the meteorite were fruitless, as for some reason all parties were searching near the city of Kansk, and not in the locality, determined by A. V. Vesnesenski, whose observations unfortunately remained unpublished. Gradually interest in the new meteorite died, and the whole matter was almost forgotten, except as a tale among the natives.

In 1927 Mr. L. Kulik attempted to find the exact location of the meteorite and led an expedition to the Tunguska region. Owing to the lack of funds and the extreme difficulties of transportation in the wilderness of taiga and tundra, the expedition was not altogether successful. However, Mr. Kulik was able to reach the area where the taiga bore distinct traces of the passage of the meteorite. An area struck by the meteorite is a water table between the upper part of the Podkamennaya Tunguska and its right tributary the River Chuni. The area is largely covered with tundra in the process of formation, intersected by hills, small lakes, swamps and typical tundra. The immediate area is surrounded by high naked hills, deforested by the falling meteorite. All trees are still on the ground, their tops are spread out in fan-like fashion away from the central zone of the fall. Exceptions are noted only in the ravines or in the gorges and deep perpendicular valleys and also in a zone which can be considered as the "interference" zone. And even in these places the trees, in most cases, are scorched and though still in upright position they are all leafless and dead.

The zone where the heat effect of the meteorite is evident is considered by L. Kulik to be 30 kilometers in diameter and the area of the air-wave breaking the trees is 50 kilometers in diameter.

The central part of the "fire zone" is covered by shallow "funnel" shaped craters, reaching in some instances many tens of meters in diameter and not greater than 4–5 meters in depth. The bottom of the craters is covered with swampy growth.

Unfortunately, Mr. Kulik was not able to find the body of the meteorite or determine the depth to which it had sunk.

He believes that the meteorite of 1908 was an aggregate (a swarm) of meteors, moving with a rate approaching 72 kilometers a minute. Some of the aggregates undoubtedly exceeded 130 tons in weight. Hot gases (above 1,000° C.) surrounded the meteorite and started fires before the meteorite had reached the ground and sunk into it, forming craters, uprooting the trees and burning everything that can burn in the center of its fall.

GEORGE P. MERRILL

U. S. NATIONAL MUSEUM

CONCERNING A RHIZOCTONIA WHICH FORMS HYMENIAL CELLS AND BASIDIOSPORES IN CULTURE

WHILE investigating root-rot diseases of alfalfa in October, 1924, a Rhizoctonia was isolated from a mass of hymenial cells and basidiospores which occurred on one of the diseased alfalfa plants. Several weeks later this Rhizoctonia was observed to have produced its perfect stage in pure culture and has continued to form hymenial cells and basidiospores up to the present time, when grown on certain artificial media and under proper external conditions.

Numerous single-spore isolations have been made from individual basidia of the spore-forming Rhizoctonia and with very few exceptions, all have formed spores. While under constant observation through a microscope, complete sets of spores have been picked from basidia by means of a Barber micromanipulator. All of the spores that germinated and continued to grow formed the perfect stage similar to the original isolation. This Rhizoctonia, therefore, is considered to be homothallic.

The hyaline mycelium formed by this Rhizoctonia can not be mistaken for that formed by *R. crocorum* (Pers.) D.C., which also occurs on alfalfa, and it is not believed that the two fungi are genetically connected. Cultures of Rhizoctonia were received from plant pathologists in various parts of the United States and amongst these one was found which is believed to be similar to the spore-forming Rhizoctonia isolated in Michigan. The former culture was isolated in Minnesota from an alfalfa root, which apparently was not affected with the violet root-rot disease. When grown under similar conditions the Minnesota Rhizoctonia was found to have spores and other characters identical with that of the Michigan strain.

The spore-forming fungus under consideration differs in many ways from *Rhizoctonia solani* Kühn (*Corticium vagum* B. & C.). The mycelium of the former is characteristically hyaline and lacks the brown color associated with *R. solani*. The sclerotia are smaller and less numerous. These differences are especially pronounced when the two fungi are grown on potato dextrose agar. Differences in sterigma length and in spore size distinguish the perfect stages of these two Rhizoctonias.

The perfect stage of the new spore-forming Rhizoctonia is apparently to be considered as a *Corticium* which is characterized, both on artificial media and upon inoculated alfalfa plants, by the unusual length of sterigmata.

J. E. KOTILA

MICHIGAN STATE COLLEGE AND
UNIVERSITY OF MICHIGAN

MODELING CLAY AS A SUBSTITUTE FOR COLOPHONIUM WAX IN THE PHYSIOLOGICAL LABORATORY

IN the experience of the writer and of several associates the colophonium wax which has such a general use in the physiological laboratory has proven unsatisfactory in several ways. Plasteline modeling-clay has been found a satisfactory substitute and free from some of the faults of the wax. This is due to its more stable consistency. It does not require warming before use. Low temperatures do not cause

it to break loose, and warming, such as it may receive when used to attach writing points to signal magnets, does not cause it to melt.

R. R. DURANT

OHIO STATE UNIVERSITY,
COLUMBUS, OHIO

A "DATA" OF RESEARCH

WITH regard to the note on the pronunciation of "research" by Dr. Kopeloff in SCIENCE for March 23, 1928: To an ex-philologer the use of the singular verb with "data" is even more annoying than its mispronunciation (whatever the correct pronunciation may be). The next generation will very likely have forgotten that it ever had a plural verb. There has been suggested the ethical distinction that research denotes scientific investigation proper; while résearch denotes work of a compiling or reclassifying nature under direction.

From the point of view of linguistics we were taught that languages with stress-accents like the American-English tended to pull the accents towards the beginnings of words. Two examples of this process occur to me. As a boy I recall frequently having heard "advertisement" accented on the third syllable. One almost never hears this now and seldom on the second syllable, the dominant position of the accent being on the first. Within more recent years the word "automobile" has become generally accented on the first syllable, although in its early days it was frequently accented on the last and occasionally on the third syllable.

F. L. WELLS

BOSTON PSYCHOPATHIC HOSPITAL

SCIENTIFIC BOOKS

Brachiopod Morphology and Genera (Recent and Tertiary. By J. ALLAN THOMSON, director of the Dominion Museum, Wellington, New Zealand. Man. No. 7, N. Z. Board Sci. and Art, 1927. Obtainable from the Government Printer, Wellington, or the High Commissioner for New Zealand, London. Price, 17s. 6d.

STUDENTS of brachiopods, recent or fossil, will welcome this well-reasoned contribution to their literature, which is the culmination of a series of papers beginning in 1915. The book falls into three major divisions—morphology, classification and description of genera and species. As might be expected from the earlier papers, the section on brachiopod morphology (pp. 1–108) is particularly valuable, bringing together, as it does, all our present knowledge of the soft parts of these animals, the stages of development through which they pass, and the various shell parts, external and internal, with their growing terminology, treated in considerable detail and well illustrated.

In the section on classification, Dr. Thomson proposes two new major divisions, Gastrocaulia and Pygocaulia, which are practically coextensive with Huxley's Inarticulata and Articulata; in the new classification, however, the division is made on the mode of origin of the pedicle which in the Gastrocaulia develops "within the valves of the protegulum during the free-swimming stage from the ventral mantle-lobe and subsequently is protruded," whereas in the Pygocaulia it arises out of "the caudal segment of the embryo and is never enclosed within the shell." Well founded as these new divisions are, however, it will doubtless be difficult for them to displace the long-established Huxleyan terms. Within the Gastrocaulia he includes the orders Atremata and Neotremata of Beecher, with amended diagnoses, but within the Pygocaulia, in addition to Beecher's Protremata and Telotremata, he makes a new order, Paleotremata, to include the Rustellacea and Kutorginacea, *i.e.*, "primitive Pygocaulia without fully developed articulation or delthyria." The reviewer agrees that these two superfamilies should be removed from the Atremata, but would refer them to the Protremata rather than create a new order. Nor can he accept Thomson's reference of the Paterinidae (Paterinacea) to the Neotremata, since they show all the ordinal characters of the Atremata. The shell growth in typical *Paterina* is hemiperipheral, while in most of the Micromitras it is mixoperipheral; nevertheless, the pedicle issues from between the two valves instead of being restricted to the ventral valve as in Neotremata. The Acrotretacea of the Neotremata may, as Thomson thinks, have come out of the Paterinidae, but this remains to be demonstrated. His view that the most primitive Telotremata (Rhynchonellacea) arose in the Protremata is probably also correct, but here again we do not know the actual stock of origin.

The descriptive portion of the work (pp. 120–297) deals with sixty-nine genera, eight of which are new: *Hispanirhynchia, Abyssothyris, Japanithyris, Jaffaia, Pictothyris, Neobouchardia, Pirothyris, Malleia.* Each genus is classified, briefly diagnosed, its synonyms cited, and illustrated by a line drawing of (in the majority of instances) the genotype, making the book a dependable standard of reference. Two new subfamilies are proposed: Platidiinae, to include *Amphithyris* Thomson 1918 and *Platidia* Costa 1852; and Laqueinae, to include *Laqueus* Dall 1870 and *Pictothyris* n. gen.

The volume closes with a table showing the range in time and space of the Australian Tertiary brachiopods, a selected bibliography and a full index, thus rounding out an excellent little handbook, on the

production of which both Dr. Thomson and the New Zealand Board of Science and Art are to be heartily congratulated.

CHARLES SCHUCHERT

YALE UNIVERSITY

SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE USE OF NAPHTHALENE IN NARCOTIZING EARTHWORMS

THE preparation of earthworms for use in introductory courses in biology usually involves a more or less tiresome procedure of stupefying the animals with low grades of alcohol. In an effort to find some method which would shorten this procedure, experiments were made with a number of substances. Naphthalene in alcoholic solution gave excellent and uniform results.

A stock saturated solution of naphthalene in 95 per cent. alcohol was made up. Earthworms were gathered in the evening by the aid of a flashlight, during the months of May and June. Without preliminary washing the worms were placed in a dish of water, about one hundred specimens per liter. To each liter of water were added 40 cc of the stock naphthalene solution. Immediately the excess naphthalene was thrown out of solution as a curdy precipitate. This precipitate formed a stringy coagulum with the mucus secreted by the worms. In one hour or less the worms had become narcotized, so that pinching brought response only in an occasional worm. The animals were then washed entirely free of foreign matter. This process was not difficult, for the coagulum mentioned above did not adhere to the worms.

The specimens at this stage were found to be very flabby and wrinkled. They were laid, one by one, in fully extended condition, upon a dry paper towel in the bottom of a clean dish. All immature or injured individuals were discarded at this point. After some two or three hundred worms had been arranged on the towel, the latter was folded over and held in place, so that the position of each worm would not be disturbed while the following solution was poured on:

glacial acetic	10 cc
formalin	10 cc
copper sulphate	1 gm
water	1 liter

After a few hours in this solution the worms were found plump, fully expanded and well hardened. They were then transferred, without washing, to 95 per cent. alcohol for storage until needed.

Mixtures of alcohol and formalin may be used as storage solutions. In such solutions it is advisable to include a small quantity of copper sulphate. The bodies of worms as prepared for laboratory use contain a considerable amount of water, and this may dilute the alcohol to such a point that molds are likely to invade the solution and destroy the specimens. Molds which are able to live in fairly strong solutions of alcohol and formalin are unable to get a foothold in solution containing a very small quantity of copper sulphate. If this salt is present to the extent of one per cent., the tissues will be strongly colored. If this is deemed undesirable the amount may be greatly reduced without serious danger of invasion by molds.

It will be noted that acetic acid was a component of the hardening solution, but not of the storage solution. This reagent serves a valuable purpose in causing the worms to become plump and turgid before the formalin has had time to harden them. Long-continued treatment with solutions containing acetic acid has a tendency to make the body wall of the worm tender and therefore easily torn during dissection. Judging by the odor, it appears probable that the acetic acid carried over from the hardening solution to the storage solution combines with the alcohol of the latter to form ethyl acetate within a reasonably short time. This last compound does not appear to injure the tissues.

Comparative tests were made to determine the effects of naphthalene and of alcohol upon earthworms. Ten active worms were placed in a liter of water in each of two dishes. To dish A was added 40 cc of 95 per cent. alcohol; to dish B, 40 cc of saturated solution of naphthalene in 95 per cent. alcohol. At the end of three minutes the worms in dish A were active and writhing; in dish B they were performing peculiar movements as if tying themselves into knots. At the end of thirty minutes the worms in dish A were still active; those in dish B were quiet and moved only slightly after pinching. To test the depth of narcosis 5 cc of glacial acetic acid were added to each dish. The worms in dish A became very active immediately; those in dish B moved feebly. This experiment was repeatedly tried with uniform results. It appears clear that naphthalene has distinct powers as a narcotizing agent in the treatment of earthworms. Experiment demonstrated that worms showing slight movement after thirty minutes in the naphthalene solution, as used, could safely be placed in the hardening solution. The movements of the anterior ends were so feeble that in masses of closely compacted worms the anterior ends failed to get out of position to any serious extent.

This method has several attractive features. The naphthalene brings about narcosis in a relatively short

time. Moreover, narcosis is accompanied by extreme relaxation both of the circular and of the longitudinal muscles of the worm. Full extension of the worm is therefore made possible. So great is the relaxation of the circular muscles that the body wall is thrown into a series of deep longitudinal wrinkles. These, however, entirely disappear during treatment in the hardening solution. The removal of mucus and foreign matter is easy, due to the fact that the strongly coherent coagulum does not adhere to the worms. If the worms are placed in running water the coagulum floats away as the mass is gently agitated. This method gives rapid narcosis, ease in freeing the specimens from foreign matter and mucus, and plump, well-hardened specimens.

ELBERT C. COLE

SPECIAL ARTICLES

THE EFFECTS OF SELECTIVE SOLAR RADIATIONS ON GROWTH AND DEVELOPMENT

TEN chicks (banded) were selected from each of the eight groups used by Higgins and Sheard in their investigations on the parathyroid glands as influenced by selective solar radiations. The filters used were: amber (Pittsburgh No. 48), blue (Pittsburgh No. 56), ordinary window-glass and vitaglass, each about 2 mm. in thickness. To the diet of half of the chicks, 2 per cent. (by weight) of cod-liver oil was added. The standard diet was the Wisconsin all-mash ration, consisting of eighty pounds yellow corn, twenty pounds shorts, five pounds bone-meal, five pounds limestone grits and one pound salt.

The growth of the chicks was estimated from the average weight of the same ten chicks from each of the eight compartments, respectively, the weights being taken biweekly. During the first eighty days it was found that the curves showing the relationship between average weight and age practically coincided when 2 per cent. cod-liver oil was added to the ration, and that similar curves of weight when the standard ration only was fed exhibited the greatest departure from normal (vitaglass or standard ration with cod-liver oil) in the case of the chicks under the amber filter, with blue-glass next. The influence of unfavorable weather conditions (heat and humidity) on the average weight was least marked under vitaglass and most noticeable under the blue and amber filters. The experiments over the eighty-day period indicate that cod-liver oil compensates, in a large part, for the absence of vitamin D, and that the presence of ultra-violet rays of short wave-length (300–330 millimicrons) is an added factor in overcoming various degenerative tendencies.

At the end of six months it was found that the average weight was practically the same (within 3 per cent.) under each of the filters if cod-liver oil was added to the diet. Without cod-liver oil, no departure in average weight was found under vitaglass, 10 per cent. under ordinary glass, 20 per cent. under blue-glass, and 30 per cent. under the amber filter. By reason of the percentages of transmission of solar energy through these filters, together with the fact that the blue-glass used transmits slightly lesser wave-lengths than does ordinary glass and a slightly greater percentage of ultra-violet light, we are forced to the conclusion that the presence of both the longer and shorter (ultra-violet) wave-lengths of sunlight is essential to normal growth.

These results also emphasize the rôle which the parathyroids play in the growth and development of chicks. Hyperplasia of these glands occurs under blue and amber filters in the absence of cod-liver oil. We may postulate that hyperplastic parathyroids develop in an attempted rectification of hypofunctioning through an increase in the size of the glands in order to produce as nearly normal metabolism and development as is possible. Initially, normal growth and development are accomplished through a multiplicity of the functional units. These ultimately break down, causing metabolic disturbances and deficiency diseases.

Our experiments, insofar as they parallel the investigations of others, are not in accord with conclusions commonly accepted. In the experiments of Bovie, young chicks were taken and variously grouped under an environment of sunlight and of light through a greenhouse roof. Their rations consisted of so-called regular feed, regular feed and green stuff, regular feed and cod-liver oil. At the end of the sixty-fifth day it was found that the total weight of the chickens receiving sunlight only through the greenhouse roof is about one-half of the total weight of all the chickens exposed to outdoor sunlight or to the light from the ordinary quartz lamp.

The difference in experimental data and conclusions may be due either to difference in quality of stock or the character of the ration or to both. Obviously, inferior stock will succumb to conditions which will have no effect on superior stock. The matter of ration is evidently important. Our ration was high in its content of minerals (calcium). Biweekly determinations showed that the calcium was about 12 mg for each 100 cc. of serum and the phosphorus about 6 mg. for each 100 cc. of serum during the first three months of observation, irrespective of the character of the light filter.

In conclusion, we have found from experimental data on the quality and quantity of energy in solar

radiation transmitted by the various filters and calculations made therefrom, due regard being given to the experimental results on the influence of selective solar irradiation upon the parathyroids, that an energy-equivalent of the short or so-called vital rays (290 to 320 millimicrons) of 0.045 gram calorie per each square centimeter each minute is ample to produce normal development.

CHARLES SHEARD
GEORGE M. HIGGINS
MAYO CLINIC AND MAYO FOUNDATION

VITAMIN B—A QUESTION OF NOMENCLATURE

RECENT literature on the composite nature of vitamin B has been very confusing, partly through the failure of some investigators to accept, or at least make clear, the idea that neither of the two factors now believed to be contained in what was originally called water-soluble B and later vitamin B promotes growth in the absence of the other and partly through lack of conformity in naming the two factors.

The question of the identity of the antineuritic vitamin and vitamin B had always been a puzzling one, so closely did they resemble each other in many ways. In 1919 Mitchell[1] in a critical review of the literature on the subject called attention to certain discrepancies in solubility, stability and occurrence of the two vitamins which, in his opinion, cast considerable doubt on their identity and suggested the need of more quantitative experiments in which the same materials should be tested for the prevention of polyneuritis in pigeons and the promotion of growth in young rats—the criteria commonly employed for the study of the antineuritic vitamin and vitamin B, respectively.

Later work, chiefly along the lines suggested by Mitchell, including studies by Emmett and Luros,[2] Funk and Dubin,[3] Heaton,[4] Levene and Muhlfeld,[5] and Hauge and Carrick,[6] strengthened the growing belief in the non-identity of the two vitamins and threw some light on their relative distribution in nature. One or two of these papers contained suggestions to the effect that vitamin B might not be a single substance, but might include the antineuritic vitamin in its make-up, but these received little attention at the time on account of lack of evidence or emphasis on other points. In 1926, Smith and Hendrick[7] called attention to the supplementing action of autoclaved yeast for rolled oats as a source of vitamin B and a similar supplementing action of the autoclaved yeast for the Seidell antineuritic vitamin concentrate and suggested the possibility that a heat-stable vitamin was necessary in addition to vitamin B for the growth of rats. Their experimental work was confirmed by Seidell[8] and by Goldberger, Wheeler,

NOMENCLATURE OF THE HEAT-LABILE AND HEAT-STABLE FACTORS OF VITAMIN B

Author	Heat-labile factor	Heat-stable factor
Goldberger *et al.*	Vitamin B *sensu stricto*	P–P factor
Sherman	Vitamin F	Vitamin G
Randoin and Lecoq	Antineuritic factor	Maintenance or functioning factor
Salmon	Vitamin B–P	Vitamin P–P
Chick and Roscoe	Antineuritic vitamin	Vitamin B *sensu stricto*
Plimmer *et al.*	B_1	B_2
Plimmer *et al.*	Vitamin B	Vitamin P–P
Evans and Burr	Antineuritic vitamin B	Growth-promoting vitamin B
Williams and Waterman	Heat-labile factor	Heat-stable factor
Eddy	Antineuritic factor	Antipellagric factor

[1] Mitchell, H. H., 1919: "On the Identity of the Water-soluble Growth-promoting Vitamin and the Antineuritic Vitamin." *J. Biol. Chem.*, 40, 399.

[2] Emmett, A. D., and Luros, G. O., 1920: "Water-soluble Vitamins. I. Are the Antineuritic and the Growth-promoting Water-soluble B Vitamins the Same?" *J. Biol. Chem.*, 43, 265.

[3] Funk, C., and Dubin, H. E., 1921: "The Vitamins of Yeast and Their Rôle in Animal Nutrition." Proc. Soc. Exptl. Biol. Med., 19, 15.

[4] Heaton, T. B., 1922: "On the Vitamin D." *Biochem. J.*, 16, 800.

[5] Levene, P. A., and Muhlfeld, M., 1923: "On the Identity or Non-identity of Antineuritic and Water-Soluble B Vitamins." *J. Biol. Chem.*, 57, 341.

[6] Hauge, S. M., and Carrick, C. W., 1926: "A Differentiation between the Water-soluble Growth-promoting and Antineuritic Substances." *J. Biol. Chem.*, 69, 403.

[7] Smith, M. I., and Hendrick, E. G., 1926: "Some Nutrition Experiments with Brewers' Yeast with Special Reference to its Value in Supplementing Certain Deficiencies in Experimental Rations." U. S. Pub. Health Rpts., 41, 201.

[8] Seidell, A., 1926: "Comparison Between the Pigeon and the Rat Methods of Testing for Antineuritic Vitamin." Bul. soc. chim. biol., 8, 746.

Lillie, and Rogers,[9] but in interpreting their results Goldberger and his associates suggested what appeared to be the clue to the baffling problem of the relationship between the antineuritic vitamin and vitamin B—namely, that for the growth-promoting function of vitamin B two factors are necessary, (1) the antineuritic vitamin and (2) a heat-stable factor which they suggested might be identical with the factor which they believed to be responsible for the prevention and cure of pellagra.

Whether or not the heat-stable factor with which the antineuritic vitamin must be supplemented for the growth-promoting function of vitamin B is the vitamin responsible for the cure or prevention of pellagra has not been established with certainty, but the investigations of Salmon,[10] Chick and Roscoe,[11] Hassan and Drummond,[12] Sherman and Axtmayer[13] and Williams and Waterman[14] have furnished a convincing verification of the multiple nature of vitamin B and of the part played by the antineuritic vitamin and a heat-stable vitamin as components of the mixture. In fact, food materials are now being retested for vitamin B in terms of their relative content of the heat-labile antineuritic vitamin and the heat-stable vitamin and it is being demonstrated that certain foods previously considered to be deficient in vitamin B require supplementing only by very small amounts of preparations rich in one or the other of the two factors.

With the general acceptance of the belief that vitamin B is not a single substance, the present lack of uniformity in the use of the term vitamin B and in designating the factors of which it is composed is regrettable. A confusion of terms, necessitating in every paper dealing with vitamin B an explanation of the author's system of nomenclature for the two factors, tends to bewilder the reader who finds vitamin literature difficult to follow at best. Some of the terms which have been used in papers appearing within the past two years are given in the accompanying table.

In attempting to evaluate these terms, it should be kept in mind that the term vitamin B has always been used to denote the water-soluble, appetite-stimulating, growth-promoting vitamin originally named by McCollum water-soluble B and never the antineuritic vitamin, *except as the two were considered identical.* This being the case, the term vitamin B can not be used *sensu stricto* for either the antineuritic vitamin or the heat-stable vitamin, since neither of these fulfils the conception for which this term has always stood. It is the mixture of the two in suitable proportions rather than either one alone that is vitamin B *sensu stricto.* The same argument applies to the use of the term *growth-promoting* vitamin B for the heat-stable factor alone. The use of the terms B_1 and B_2 suggests that the two vitamins are not separate substances, but simply parts of a single substance, whereas even the proponents of this classification have stated in unqualified terms their belief in the separate existence of the two factors. Moreover, designations involving subscripts are awkward to handle and confusing to remember.

With the elimination, for the reasons stated, of the classifications in which the term vitamin B is used for either factor alone and the one retaining the letter B with subscripts, the remaining terms fall under three systems of nomenclature, (1) an entirely new system in which the first letter of the deficiency disease associated with absence of the vitamin in question is hyphenated with P for preventive, (2) the well-known system employing adjectives descriptive of the pathological symptoms induced by entire absence of the vitamin, and (3) the simple alphabetical system first suggested by McCollum in his "fat-soluble A and water-soluble B," simplified by Drummond to vitamin A and vitamin B, and followed consistently ever since of naming each vitamin in alphabetical sequence as soon as proof of its separate identity is established.

To accept the first of these systems of nomenclature involves an entire new series of terms. If vitamin B–P and P–P are to be used for the beriberi-preventive and pellagra-preventive vitamins, we should speak of vitamin O–P or X–P, vitamin Sc–P, etc. This would seem to be a sufficient argument against the adoption of B–P and P–P. The chief arguments against the second system are the unwieldiness of the terms for common usage and the undue emphasis which they place upon the outcome of complete absence of the vitamin, suggesting that the only func-

[9] Goldberger, J., Wheeler, G. A., Lillie, R. D., and Rogers, L. M., 1926: "A Further Study of Butter, Fresh Beef and Yeast as Pellagra Preventives, with Consideration of the Relation of Factor P-P of Pellagra (and Black Tongue of Dogs) to Vitamin B." U. S. Pub. Health Rpts., 41, 297.

[10] Salmon, W. D., 1927: "On the Existence of two Active Factors in the Vitamin B Complex." *J. Biol. Chem.*, 73, 483.

[11] Chick, H., and Roscoe, M. H., 1927: "On the Composite Nature of the Water-soluble B Vitamin." *Biochem. J.*, 21, 698.

[12] Hassan, A., and Drummond, J. C., 1927: "The Physiological Rôle of Vitamin B. Part IV. The Relation of Certain Dietary Factors in Yeast to Growth in Rats on Diets Rich in Proteins." *Biochem. J.*, 21, 653.

[13] Sherman, H. C., and Axtmayer, J. H., 1927: "A Quantitative Study of the Problem of the Multiple Nature of Vitamin B." *J. Biol. Chem.*, 75, 207.

[14] Williams, R. R., and Waterman, R. E., 1927: "The Composite Nature of Vitamin B." Proc. Soc. Exptl. Biol. Med., 25, 1.

tion of the vitamin is in the prevention of particular deficiency diseases.

If the third system is to be continued as the simplest and most usable, how can it best meet the peculiar difficulty of recognizing a subdivision of a previously named vitamin into two entirely separate substances, one of which is likewise a vitamin of long standing, but which hitherto has had only a descriptive name—antineuritic vitamin. As was stated earlier, vitamin B has always stood for a water-soluble, appetite-stimulating, growth-promoting substance. To shift the letter B to either the antineuritic vitamin or the heat-stable vitamin would mean an entire change in significance which, on historic grounds alone, would be unfortunate. To retain it in its original sense involves no real change in conception, even although we know that for the properties denoted in the descriptive adjectives associated with it at least two separate vitamins are involved, each with certain individual properties. These vitamins, to take their place in the vitamin alphabet, should automatically receive the letters F and G, F being assigned to the earlier known, heat-labile antineuritic vitamin and G to the heat-stable vitamin which possibly has antipellagric properties. To those who find it difficult to distinguish vitamins by letters, it is a happy coincidence that the letters are the initials of the two investigators, Funk and Goldberger, most closely associated with these vitamins.

S. L. SMITH

OFFICE OF EXPERIMENT STATIONS,
U. S. DEPARTMENT OF AGRICULTURE

THE FEDERATION OF AMERICAN SOCIETIES OF EXPERIMENTAL BIOLOGY

THE annual meeting of the Federation of American Societies for Experimental Biology was held at the University of Michigan, Ann Arbor, Mich., April 12, 13 and 14, 1928.

The first meeting, a joint session of the societies of which the federation is comprised, was held Thursday morning. The program consisted in the presentation of nine papers which had been selected as being of general interest to the members of all four societies. It would be impossible to select one or more of the papers as being of outstanding value without doing injustice to the authors of the others whose names appeared on the program. Suffice it to say, they were all meritorious, but differed in interest, depending upon the particular field in which the listener might be actively engaged.

The afternoon was devoted to the reading of papers by the constituent societies of the federation, namely, the Physiological Society, the Biochemical Society, the Pharmacological Society and the Pathological Society.

Owing to the large number of titles presented, the Physiological Society was obliged to hold a double session each day in order to allow for the presentation of all the papers.

The Biochemical Society likewise was obliged to hold a double session Friday morning.

Friday afternoon was devoted to joint demonstrations by all societies. Thirty-seven demonstrations were on the program, which was a marked increase above the number given at any previous meeting. They were in practically all instances most interesting and instructive.

The final meeting, a joint session, was held Saturday afternoon, when another group of papers of unusual interest was presented.

Regarding the meeting it may be stated that it was the largest in point of attendance of any held during the history of the federation. An unusually large number of titles was presented under the "introduced by" and "by invitation" list. The authors of these papers were, for the most part, of the younger generation, who in the majority of cases occupy minor teaching positions or are doing research work as undergraduates.

All the foregoing speaks favorably as regards the popularity of a spring meeting. This was the second meeting held at this time of the year, the first being one year ago when we met at Rochester, New York. The executive committee of the federation, recognizing the discomfort of traveling in the holiday season and the reluctance of some of the members in absenting themselves from their families during the Christmas holidays, recommended that the time of holding the annual meeting be changed. The proposition of making a change met with some opposition, but the experiment was made and has proved to be very successful.

It was voted that our next meeting be held at Boston, Mass., at the time of the meeting of the International Physiological Congress. The federation meeting will be merged with the meetings of the congress.

This report would be incomplete if the excellent services and the hospitality shown by the members of the University of Michigan were not mentioned. The local committee left nothing undone which could further add to our comfort and convenience.

The board of regents of the university kindly provided a complimentary dinner on Thursday evening, to which all in attendance were invited as their guests.

Everything considered, it was the most successful meeting ever held during the history of the federation.

E. D. BROWN, *Secretary*

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SCIENCE NEWS

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ELECTRONS AND WAVE MATTER

SO-CALLED "solid" matter—the bricks of our homes, the sidewalks we walk on, in fact, even the tissues of our own bodies, may consist ultimately of waves, or vibrations. Such is one of the startling conclusions that might be drawn from experiments at the Bell Laboratories by Dr. C. J. Davisson, in collaboration with his colleague Dr. L. H. Germer. An extended account of the researches will be given by Dr. Davisson in an article to appear shortly in the *Journal* of the Franklin Institute.

The experiments indicate that electrons—one of the important parts of the atoms of matter—may really be waves, and not the infinitesimally tiny particles that previous scientists have supposed them. What Dr. Davisson and his associate have done is to study the way that a beam of electrons, given off from a glowing electric light filament, is reflected from a crystal of nickel. They found that the electrons were reflected in the same way that light waves would be reflected. That is, if the beam hit the face of the crystal at an angle of 45 degrees, for example, it left at the same angle. "The angle of reflection being equal to the angle of incidence."

At first glance, says Dr. Davisson in his forthcoming article, this might not seem inconsistent with the theory that the electrons are actual particles. But the electrons are supposed to be so small that some 25 million million would make a row an inch long. The size of the atoms is about a hundred thousand times as great, for only about 250 million of them are required to fill an inch. Furthermore, the distance between the adjacent atoms, in the nickel crystal, is something like 250,000 times the diameter of an electron.

"The difficulty of picturing the regular reflection of particles as small as electrons from a surface made up of bodies as large as atoms is at once evident," says Dr. Davisson. "If we were to fire a load of birdshot against a pyramid of cannon balls, we should not expect to find a little cloud of shot moving off in the direction of the regular reflection from the face of the pyramid. A surface made up of cannon balls is much too coarse-grained to serve as a regular reflector for particles as small as birdshot.

"The analogy is not such a good one, really, for we do not think of electrons rebounding from the surface of an atom in the way that shot rebound from a cannon ball. We have been accustomed to think of the atom as rather like the solar system—a massive nuclear sun surrounded by planetary electrons moving in closed orbits. On this view the electron which strikes into a metal surface is like a comet plunging into a region rather densely packed with solar systems."

Dr. Davisson points out that if the electrons were waves, their behavior would be perfectly understandable, for X-rays, which are supposed to be waves, are likewise reflected from a crystal in the same way. Another experiment brings out the similarity to X-rays in an even more striking way.

"We direct a stream of electrons against a target of ordinary nickel—a target made up of many small crystals instead of one large one—and we never under any circumstances find any indication of regular reflection. Electrons are not regularly reflected from a target of ordinary polycrystalline nickel.

"It seems curious that electrons should be reflected only from a crystal-face—and then we remember that this is true also of X-rays. X-rays may be regularly reflected from the face of a crystal, but not from a polycrystalline mirror. The difference between light and X-rays in this respect is due, as we know, to a difference in order of wave-lengths. The lengths of light waves are great compared to the distance between atoms in solids while the X-ray wave-lengths are comparable with these distances."

Since scientists also have good reason for supposing that the electrons are particles, there is a conflict of ideas that he can not explain. The so-called Schroedinger wave mechanics, named after its German inventor, has suggested that electrons are either made up of, or accompanied by, a system of waves and this, he thinks, may help explain the difficulty.

"Are electrons waves?" he asks. "The easiest way of answering this question is to ask another. Are X-rays waves? If X-rays are waves, then so also are electrons. But we are no longer so certain as we used to be that X-rays are waves. The Compton effect and the photo-electric effect are most simply described by supposing that there is some sense in which X-rays are particles. It is all rather paradoxical and confusing. We must believe not only that there is a certain sense in which rabbits are cats, but there is also a certain sense in which cats are rabbits."

PHOTOGRAPHS OF STELLAR SPECTRA

GIGANTIC stars that could engulf the whole solar system are transported from their far distances of hundreds of trillions of miles and set beside our own sun as a result of the latest researches of astronomy.

Spectral messages are received by a combination of the world's largest stellar spectrograph and the world's largest telescope, the 100-inch on Mt. Wilson, Calif. They are interpreted by Professor Henry Norris Russell, of Princeton University, who worked with Dr. Walter S. Adams, director of the Mt. Wilson Observatory.

The powerful spectrograph, just put in commission, gave stellar spectra photographs almost as detailed as the standard spectra of the sun, the earth's nearest star. Hundreds of lines in these fingerprints of the stars were revealed for the first time. These spectrum lines allow the astronomer to analyze the stuff of stars, take their temperature and probe their atmosphere.

"For the giant red stars, such as Antares and Betelgeuse, the total quantity of material above a square mile of the visible surface is apparently about a hundred times as great as in the sun," Professor Russell said.

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"Procyon, a dwarf star only a little brighter and probably no larger than the sun, has an atmosphere comparable with the sun's in extent."

The lines of the new photographs tell the proportion of excited atoms loaded with energy and thus determine the temperatures, which range from 3,000 to 10,000 degrees Centigrade for the stars studied.

THE GREEN SUNSET RAY

INTENDING voyagers to Europe during the next few months should carefully watch the setting sun, and they may be able to see the "green ray." This is the brilliant green coloration that the sun assumes just before its last narrow sliver disappears behind the horizon. A really satisfactory sight of it is rather rare, said Professor R. W. Wood, professor of experimental physics at the Johns Hopkins University. On thirty crossings of the Atlantic he has looked for it every time there was a clear sky and no haze or clouds near the horizon at sunset, but has only seen it three or four times. Only once, he said, was it really striking. At that time it appeared a brilliant emerald green, about the color of a railroad signal.

The cause of the green ray is generally supposed to be that the rays of light are bent as if by a prism when they pass through the atmosphere of the earth. This enables us to see the sun for a short time after it is below the line of the horizon. As the red and orange rays are bent least, they disappear first behind the horizon. This leaves the green, blue and violet rays still visible. Blue and violet affect the eye much less strongly than green, and so the green color predominates.

Dr. Wood accepts this theory of the origin of the ray, but proposes a new theory to explain why it is not always seen at sunset. At the time that he saw the ray so well, the air and ocean were at approximately the same temperature. Through the rest of the voyage, when it was not seen, the ocean was much warmer than the air. He thinks that when the water is warm and the air cool, the layer of warm air right in contact with the sea would cause the light rays of all colors to be bent less, and so the sun would set abnormally early. When the air is warmer than the water, the curvature of all the rays would be increased, and so the atmospheric dispersion that causes the ray would have a longer time to act.

THE MEASUREMENT OF ULTRA-VIOLET RAYS

RADIO amplification now is to be of service in the field of medicine. Professor Ernst A. Pohle, roentgenologist of the University of Michigan, in collaboration with Walter S. Huxford, of the physics department, has designed a measuring device for ultra-violet rays, independent of other radiation which comes from quartz lamp or other light source.

In recent years ultra-violet light has come to be recognized as a cure for rickets and possibly for other diseases, but there has been no accurate means of measuring the quantity with which the patient is treated.

Up to the present time the photo-electric cell, one means of measurement, has required precision apparatus too complicated for the average physician to handle. Professor Pohle and his associate have designed one that is simple and dependable. In it a radio amplifier is used to magnify an extremely small electric current so that it can be read on an ordinary switchboard galvanometer. The current comes from a photo-electric cell, which turns light into electricity.

Only ultra-violet rays between certain definite wave-lengths are believed to have any beneficial effect upon the patient, so it was necessary to develop apparatus which would measure only light of that wave-length, disregarding both longer and shorter waves. For this purpose the metal cadmium has been utilized by Dr. Pohle and Mr. Huxford because it is most sensitive to the waves long enough to affect the skin. The glass which they use in their cell cuts off longer light waves.

Dr. Pohle and Professor Ralph A. Sawyer have also succeeded in calibrating the photo-electric cell in absolute units. This makes any recorded dose reproducible.

A RADISH-CABBAGE HYBRID

A CROSS between a radish and a cabbage, considered to be about the most difficult feat in plant breeding so far on record, has been made by Dr. George D. Karpechenko at the botanical institute at Detskoje Selo, in Russia. The Russian botanist's work is reported by Professor William Seifriz, of the University of Pennsylvania, who recently visited a number of scientific laboratories and experiment stations in the Soviet union.

Although the new plant has no economic significance at present, its development is of much interest to plant breeders because of the remoteness of the relationship between the two parents. The great bulk of our hybrids, both plant and animal, are between varieties of the same species, or even between strains or races of the same variety. Hybrids between two species within the same genus are usually hailed as out of the ordinary; the crossing of the lime and the kumquat to produce the limquat was such a hybrid. There are, however, certain crosses between species that are very common, such as the mule.

But the hybridization of radish and cabbage means that two quite distinct genera have been combined to produce something entirely new under the sun. The more remotely related the parents, the more difficult the cross is to make; and in this instance the parents are believed to be more distantly related than any plants from which successful hybrid offspring has yet been secured.

A MAGNETIC SENSE

AT the sessions of the Congress of American Physicians and Surgeons, in Washington, Dr. Frederick Tilney, professor of neurology at Columbia University, mentioned experiments now in progress on a hitherto undiscovered animal sense, the power that allows the homing pigeon to find its loft, the migrating bird its far distant summer home, the animal its burrow. This sense may prove to be magnetic. The retina of the eye was suggested by Dr. Tilney as the organ of the body in which the sense resides.

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Mere men have long marveled at the abilities of animals to find their way home through strange surroundings. Aviators need compasses and intricate instruments to navigate as efficiently as the birds of the air. Such phenomena as these gave impetus to Dr. Tilney's researches.

One clue in the search that is now under way is the fact that animals are greatly disturbed by any change of direction of their surroundings. Mice that are taught to run intricate mazes, a feat that is not dependent upon ordinary senses of sight and smell for instance, are completely baffled when the mazes are moved and oriented geographically in a different direction. They have to learn the mazes all over again.

Dr. Tilney was careful to point out that as yet his researches are in a preliminary stage. Both his own laboratories and those of the department of psychology at Columbia University are at work. If this magnetic sense is confirmed by his experiments, it will be the ninth sense. Five senses, sight, hearing, touch, taste and smell, which are the result of contact of the nervous system to environment, are familiar to every one. Then there are what Dr. Tilney called the skeletal sense and the visceral sense, both of which reside in the body itself. As the eighth, Dr. Tilney lists what he calls the hurt or pain sense, which is protective instead of guiding like the others.

THE ETHNOLOGY OF ST. LAWRENCE ISLAND

THE belief that ancient men bridging the gap between Asia and America may have left clues to their identity and their manners near Bering Strait is taking Henry B. Collins, Jr., ethnologist of the U. S. National Museum, to St. Lawrence Island, which lies just south of Bering Strait. Mr. Collins left for Seattle on May 4. He will be the first scientist to excavate in the island, though Eskimos living there have dug up a number of very old ivory harpoons and ornaments used by their forerunners. Mr. Collins will spend most of the summer locating ancient Eskimo villages and digging where excavation seems most likely to reveal traces of early inhabitants.

St. Lawrence Island would be rather south of the direct line of travel across Bering Strait. But some of the prehistoric men who found their way across the short cut between Asia and America, thousands of years ago, may have wandered to the island or stopped off there. At any rate, it is known that men have inhabited the island for many centuries.

St. Lawrence Island is about 100 miles long, but it is now inhabited by only a small group of Eskimos. Prior to 1880, the population was much larger, but in that disastrous year the Eskimos drank a good deal of bad whiskey and neglected to hunt and store up a food supply. When winter came, hundreds died from famine, and the island never regained its former importance.

Mr. Collins plans to spend some time in conducting excavations along the mainland of Alaska just south of the Arctic Circle and in making studies of the physical type of the natives.

ITEMS

M. SCHELENZ, of the Carlsruhe Museum, writing in *Naturforscher*, states that museum specimens of fish can be prepared in such a way as to be as bright and interesting and attractive as the mounted animals or birds. One side of a freshly killed fish is cleaned of its coat of mucus. The specimen is embedded in modelling clay, leaving the cleaned side projecting, melted paraffin is poured over it, forming a solid block and impregnating the fish with the wax. The paraffined fish is next removed, leaving an exact mould of itself in the clay. Into this mould fine plaster-of-paris is poured and allowed to harden. The clay is then dissolved and the plaster cast of the fish remains, with every detail of skin and scale and fin. White plaster models, "aged" for some weeks, are then coated successively with shellac and with silver or gold leaf. Finally, life colors and markings of the fish are painted by hand, and the model is given a protecting coat of varnish.

AS a result of his investigations of the common magpie, E. R. Kalmbach, biologist of the division of food habits research, states that the magpie eats more insects than any other member of the crow family and must also be credited with the destruction of a number of small rodents. These virtues, however, are counterbalanced by destruction of poultry and beneficial wild birds and their eggs. The magpie likewise preys on sick and injured cattle and has proved a nuisance and a hindrance in anti-coyote campaigns by stealing bait and tripping the traps. Poisoning is the cheapest and most effective method of destroying the magpie.

THE country around the town of Geestemuende, in Hanover, has recently suffered from an outbreak of vipers. These snakes are troublesomely poisonous, though their bites are not often fatal. The farmers' best snake-alarms were their hens, which invariably set up a clatter when a viper appeared. A number of cases were reported of battles between a snake on one side and a flock of hens on the other, in which the reptiles were invariably pecked to death.

To be eligible for the presidency of the French republic a man must be the father of at least seven children, is one of the provisions of a bill proposed by M. Jean Rameau, with the idea of increasing the dwindling population of France. A Frenchman who aspires to be a cabinet minister would have to have at least six children, according to the proposed law. If he had only five in his family, he could rise no higher than the senate. With four he might aspire to the Chamber of Deputies. To be mayor of a French town a man would have to have two children, and even a town councilor would be required to have one child, as one of his qualifications for office. The author of the plan, relying upon the aspirations of his countrymen for political careers, estimates that such a law would increase the French population by 10,000,000 in ten years.